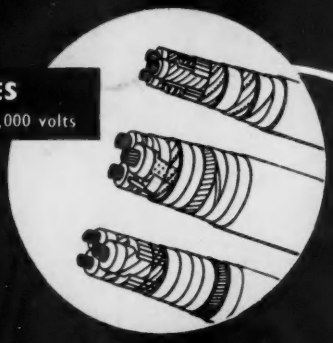
ELECTRICAL TIMES

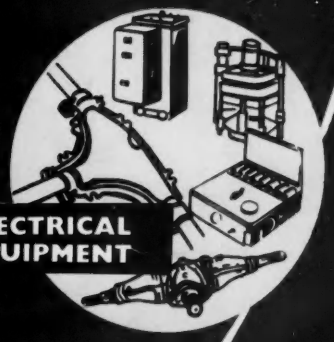
ELECTRIC CABLES
for power transmission up to 275,000 volts



BICC

as for those

PRODUCTS &
SERVICES



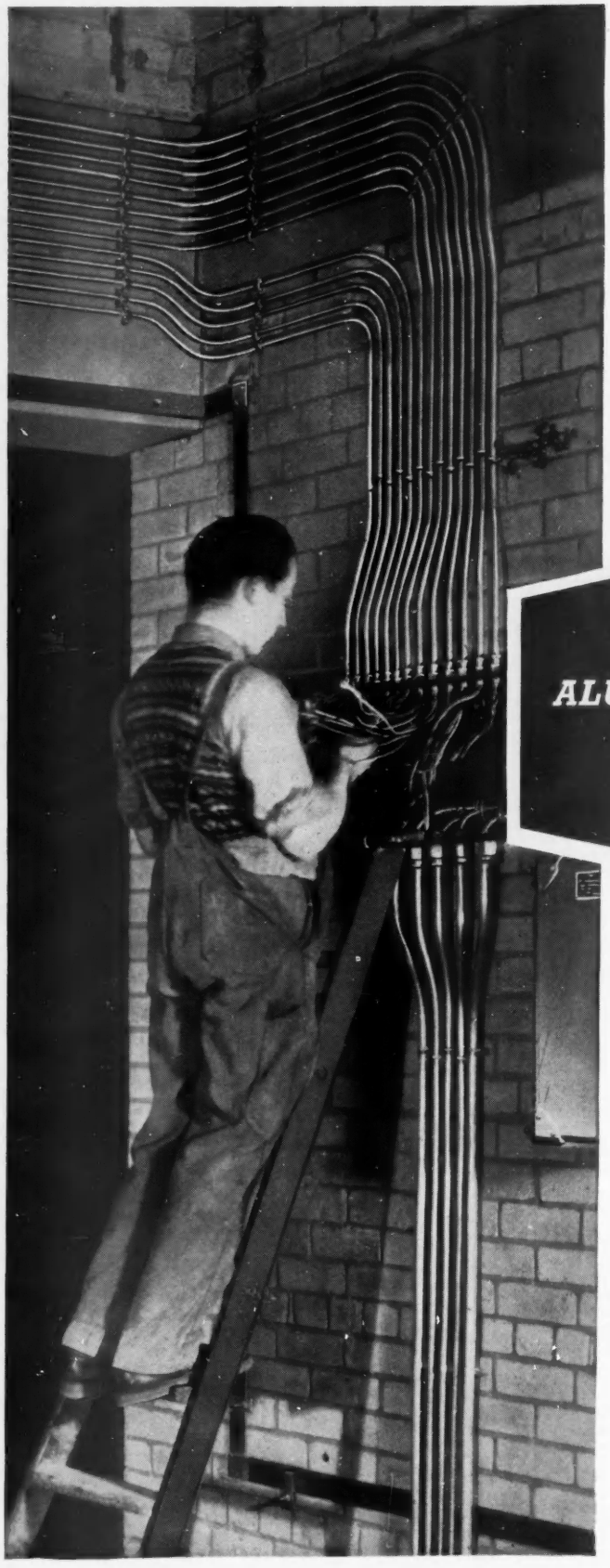
ELECTRICAL EQUIPMENT

OVERHEAD TRANSMISSION LINES

CABLES AND WIRES
for every industrial and domestic use

RAILWAY ELECTRIFICATION

BRITISH INSULATED CALLENDER'S CABLES LIMITED
21 BLOOMSBURY STREET, LONDON, W.C.1



SO EASY
to install

SO ATTRACTIVE
in appearance

and yet...
SO RESISTANT
TO DAMAGE

J. & P. ALUMINIUM SHEATHED WIRING CABLE

. . . the cable with a conduit sheath

British Patent Nos. 627815 & 627793

For cabling where there is a risk of mechanical damage, aluminium sheathed wiring cable has many installation advantages over alternative systems.

1. The cable can be readily bent by hand to the requirements of the installation, yet it retains a neat and attractive appearance.
2. Standard conduit fittings are used, yet no cutting of threads or pulling-in of cable is entailed.
3. The vulcanised rubber insulation does not readily absorb moisture and no special precautions need be taken during installation.
4. The use of stranded conductors reduces the risk of fracture.

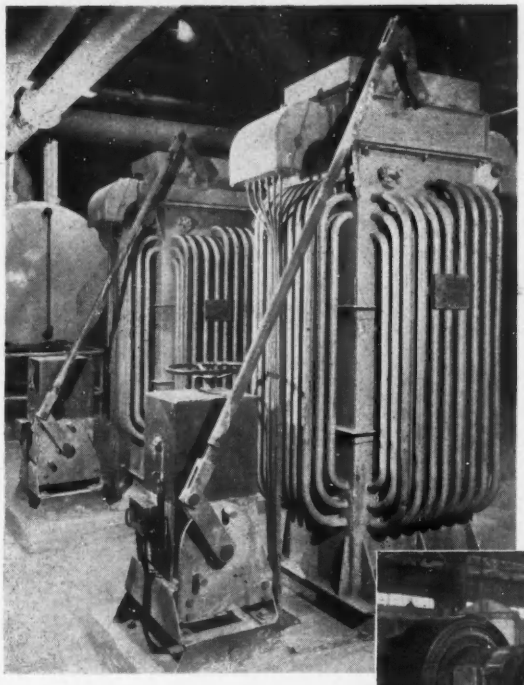
Photograph taken in the B.E.A.'s new generating station at Carmarthen Bay.

Contractors: Messrs. R. Alger & Sons Ltd.
Newport, Mon.

JOHNSON & PHILLIPS LTD.

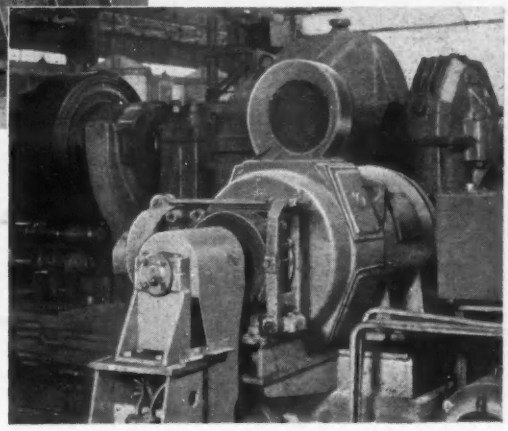
CHARLTON · LONDON · S.E.7

ELECTRICAL ENGINEERS
AND CABLE MAKERS SINCE 1875



Left: Regulators of N-S motors driving draught fans, actuated direct from combustion controller

Below: N-S motor 1500/133 r.p.m., driving re-coiler on a strip processing line



The N-S MOTOR is doing a fine job at both ends of the line

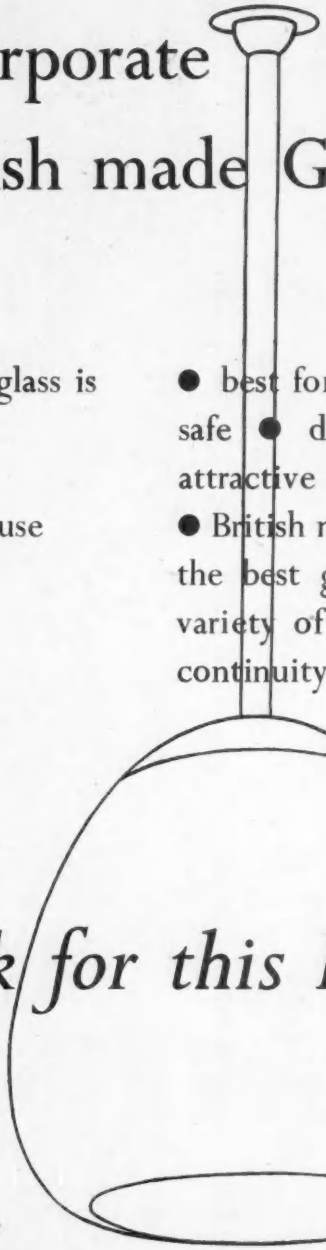
Automatic stepless speed control with the N-S a.c. motor is helping combustion engineers to save mountains of coal. For those who use power it is also speeding up production and improving quality in hundreds of instances where a few r.p.m. may make all the difference between perfection and rejection. The N-S is an outstanding motor in a range of fine machines made by specialists.

The N-S variable speed a.c. motor is made for outputs from about 1 h.p. upwards, for almost any required speed range and for hand or automatic speed control. Small sizes are available from stock

LAURENCE, SCOTT & ELECTROMOTORS LTD.

NORWICH MANCHESTER LONDON & BRANCHES

The best Lighting Fittings incorporate British made Glassware



because glass is ● best for light transmission ● safe ● durable ● reliable ● attractive ● clean

and because ● British manufacturers produce the best glassware, the widest variety of designs, and ensure continuity of supply

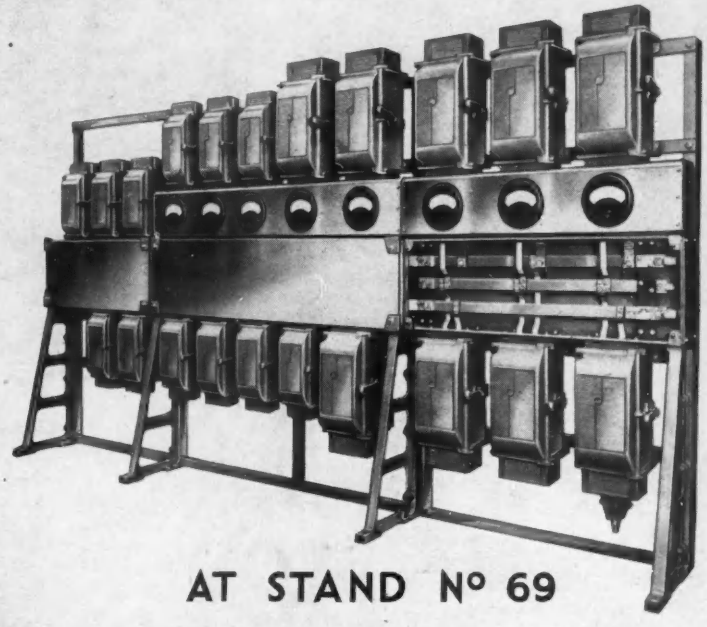
Look for this label

BRITISH GLASS G M F MADE IN ENGLAND

Issued by the
LIGHTING GLASS MANUFACTURERS' ASSOCIATION

Hailwood & Ackroyd Ltd, S. & W. (Lighting) Ltd, Webb's Crystal Glass Co. Ltd

You cannot buy better gear



AT STAND Nº 69

A COMPLETE RANGE OF L.T. SWITCH
AND DISTRIBUTION GEAR FROM 15 TO 600 AMPERES.

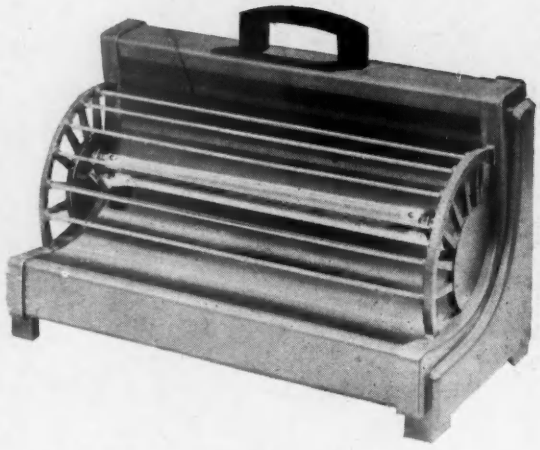
INDUSTRIAL PANELS.
SWITCHES AND SWITCHFUSES.
DISTRIBUTION BOARDS.
SWITCH SOCKETS AND PLUGS.

A.S.E.E. EXHIBITION
EARLS COURT 16TH-20TH MARCH 1954

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
BIRMINGHAM·20

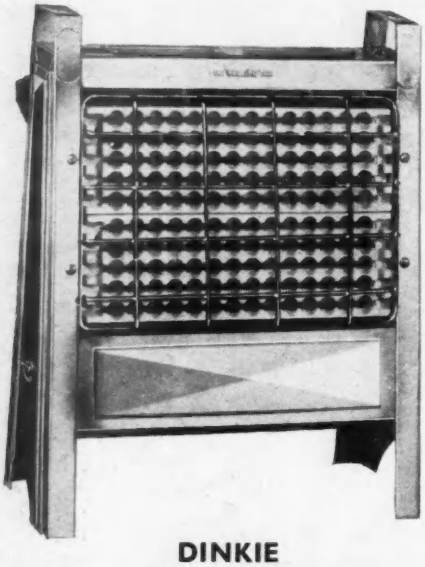
LONDON. S.W.1.	MIDLANDS.	NORTH MIDLANDS.	CHELTENHAM	MANCHESTER 3.	BRISTOL 3.	LEEDS 7.	GATESHEAD 8.	GLASGOW.
A. W. ZELLEY.	G. H. GARBETT.	C. G. BACHELOR.	C. GEARING.	H. H. POLLARD.	W. L. WHITE.	N. SHARPLES.	S. J. DAVIS.	J. D. HARRIS.
67 PETER ST.	HEAD OFFICE.	HEAD OFFICE.	LECKHAMPTON HILL	WOOD STREET.	CHURCH LANE.	2 LOVELL RD.	232 PRINCE CONSORT RD.	ST VINCENT LANE

for easy selling you can't beat a "Belling"



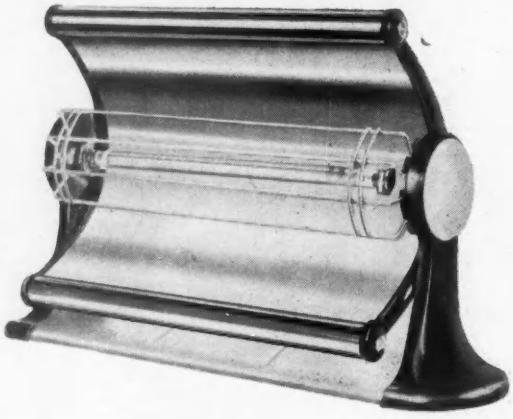
HOTSPUR

No. 141 1 kW size **£3.8.4** (inc. tax)
No. 142 2 kW size **£4.13.0** (inc. tax)



DINKIE

No. 601 1 kW size **£2.6.6** (inc. tax)
No. 602 2 kW size **£3.8.4** (inc. tax)



SOLRAY

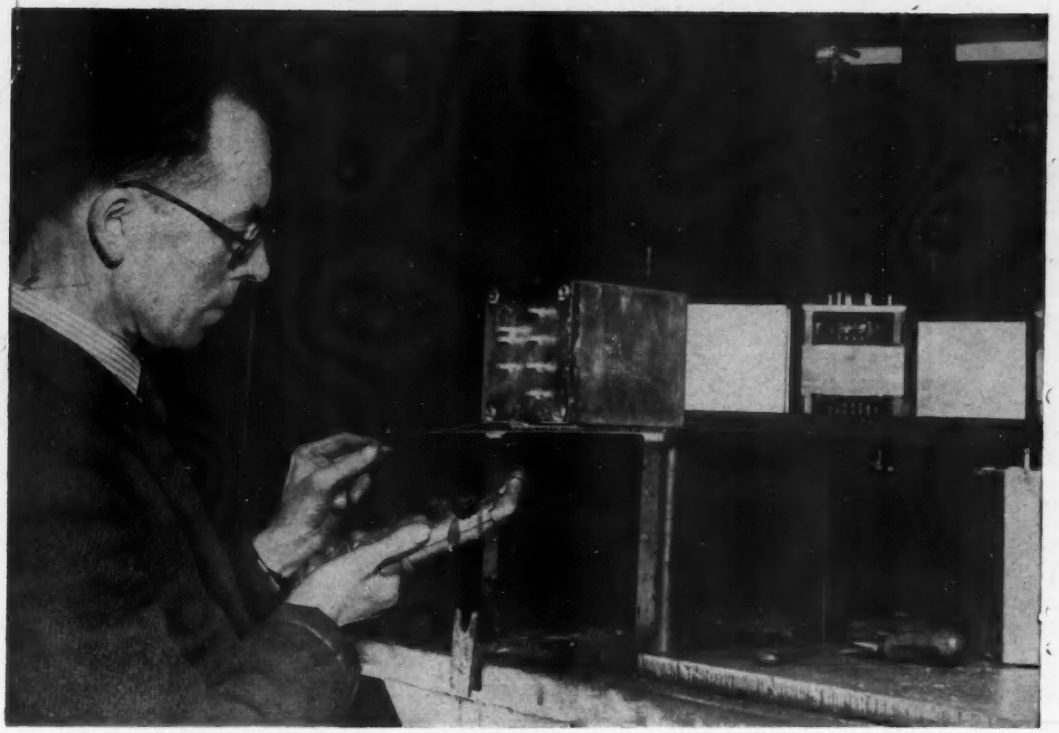
No. 151 1 kW size **£5.5.3** (inc. tax)
No. 152 2 kW size **£6.7.2** (inc. tax)

PROMPT DELIVERY

of these fires and also the 2 kW Empire (402E) £4.7.6 (inc. tax)

BELLING & COMPANY LIMITED, BRIDGE WORKS, ENFIELD, MIDDLESEX · HOWARD 1212

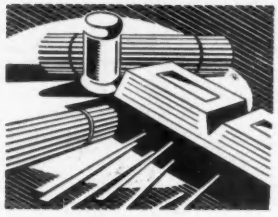
CRC 408



Photograph by courtesy of Gresham Transformers Ltd.

Where solder does an *important* job . . .

the electronic engineer relies on Enthoven products. Here a transformer is safely sealed in its case with Enthoven solid solder wire, just one of hundreds of different finishing operations successfully completed with Enthoven solders. Enthoven Tinmans, Blowpipe, Ingot, and Solid Wire Solders are supplied to B.S. 219 — 1949 and to customers' specifications. "Telecene" liquid activated rosin based flux made by Enthoven is the ideal fluxing medium for pre-tinning and dip soldering.



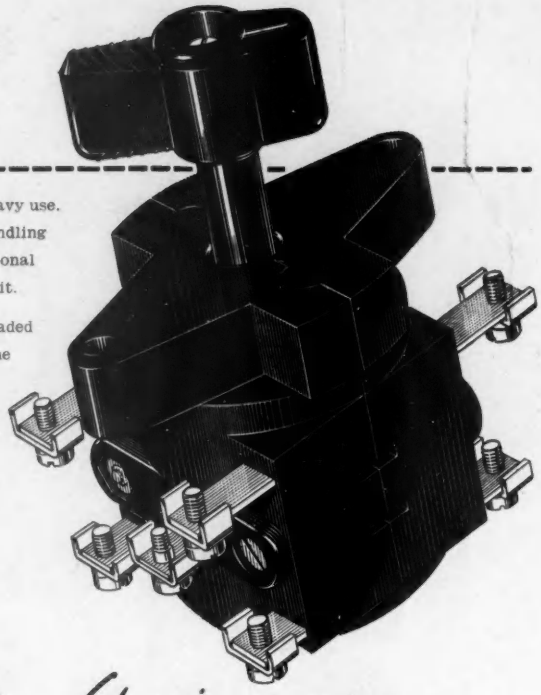
Our technical advisers and laboratory staff are available for free consultation. Technical data, descriptive literature and samples will be gladly sent on request.

ENTHOVEN SOLDER PRODUCTS

Phone : MANsion House 4533 Telegrams: ENTHOVEN PHONE LONDON

A quality multi-purpose switch

for only 10/6



At last a compact, low priced rotary switch which will stand up to really heavy use. The Austinlite "TENAMP" is a slow make-and-break switch, capable of handling loadings up to 10 amps., at 250 volts A.C., or 5 amps., at 440 volts A.C. Fractional horsepower motors up to ½ H.P. 230 or 440 volts A.C., can also be switched by it.

Fully maintaining every Austinlite quality, special features are the spring loaded roller mechanism ensuring immediate and positive location; wiping type line contacts with pressure exerted by an independent contact spring and a reversible handle for alternative mounting on panels of ¼" thickness up to ½".

Wiring instructions for 18 different circuit applications are supplied with each switch. These include:—

Three phase motor reversing.	Three heat series/parallel switching
Capacitor motor starting.	Series motor reversing.
S.P. 4 way tapping.	D.P. ON/OFF.
D.P. changeover.	

Write for illustrated leaflet.

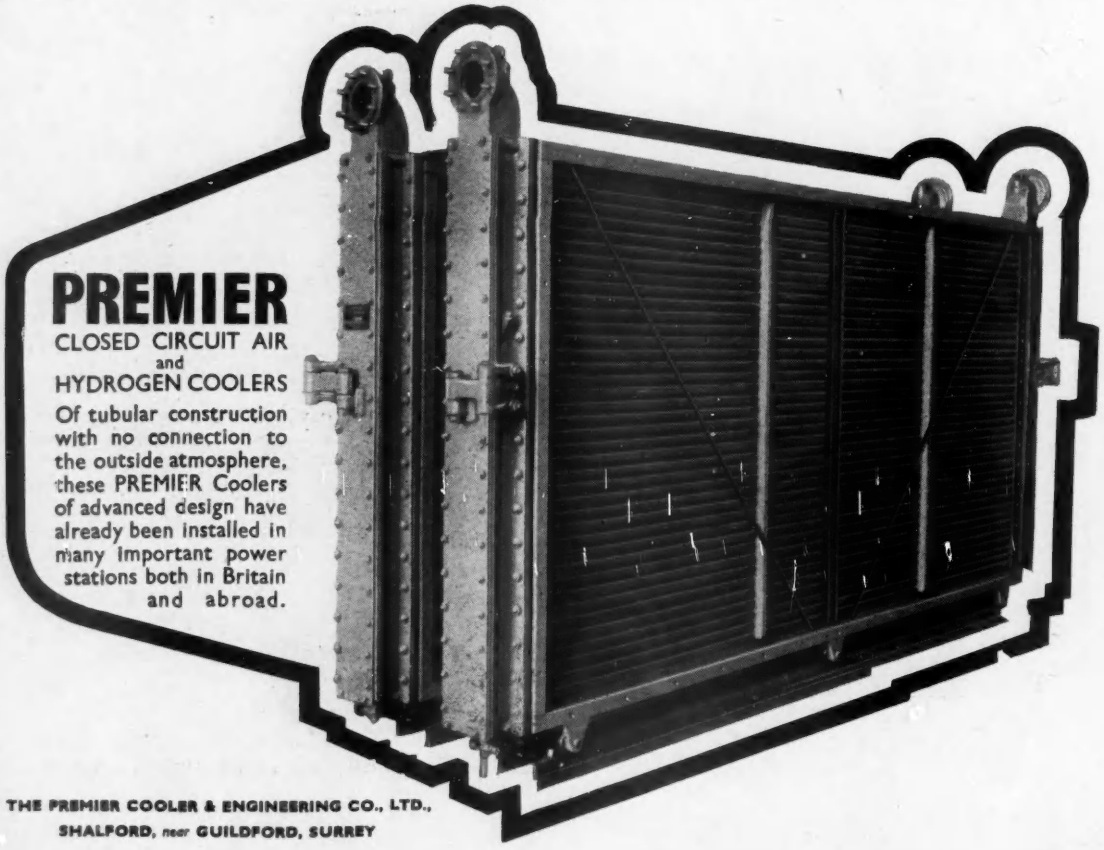
The Austinlite Tenamp switch is a Chanice product

AUSTINLITE LIMITED. DEPT. A.2, LIGHTHOUSE WORKS, SMETHWICK 40, BIRMINGHAM. TEL: WEST BROMWICH 1824.

PREMIER

CLOSED CIRCUIT AIR and HYDROGEN COOLERS

Of tubular construction with no connection to the outside atmosphere, these PREMIER Coolers of advanced design have already been installed in many important power stations both in Britain and abroad.



THE PREMIER COOLER & ENGINEERING CO., LTD.,
SHALFORD, *near* GUILDFORD, SURREY

PHILIPS

Pioneers of
Sodium Lamps
are helping to make British roads safer after dark

RIGHT from the start Philips have pioneered Sodium Lamps—now used so extensively for public lighting, floodlighting and some types of industrial lighting. These Philips Sodium Lamps give up to five times more light than ordinary lamps of similar consumption, providing increased visual acuity, enhanced contrasts and reduced glare.

PHILIPS ELECTRICAL LTD.

LIGHTING DIVISION, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

LAMPS • LIGHTING • RADIO • TELEVISION • 'PHILISHAVE' DRY SHAVERS
RECORD PLAYING EQUIPMENT • GRAMOPHONE RECORDS
'PHOTOFLUX' FLASHBULBS • ETC.

(LD419)

NON-FERROUS

WIRE and pins

Pin-making machines which produce up to 400 per minute need wire that is absolutely uniform in composition, size and 'cast'. Because of their extensive manufacturing and research facilities, I.C.I. Metals Division are equipped to supply the right non-ferrous wire not only for this but for *every* purpose.

We shall be pleased to help with any problems you may have in connection with fabricated non-ferrous products of all kinds.

A modern continuous wire-drawing machine

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI

M.167

The standard of quality and performance the world over

All listed Fuse Links available ex stock

'ENGLISH ELECTRIC'

h.r.c. fuse links

THE ENGLISH ELECTRIC COMPANY LIMITED, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

Fusegear Works, East Lancashire Road, Liverpool 10

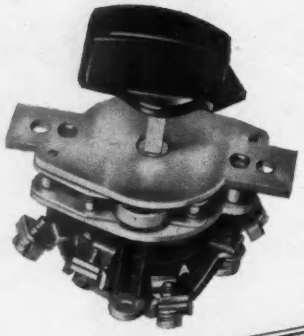
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

F.2

Control devices by

PACKET ROTARY SWITCHES

"Diamond H" offer a complete range of Packet Switches from 10—60 amps at competitive prices. Write for illustrated brochures.



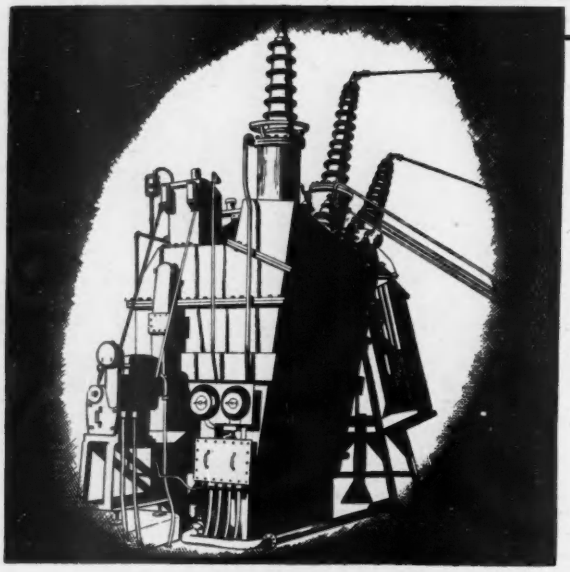
1. 10 amp 250v—5 amp 440v 4 position switches for AC only or AC/DC. Available for panel or base mounting.

2. 30 amp 250v—17 amps 440v heavy duty type 4 position switches for AC/DC; also in AC only.

World Famous Switches by

Cooker, Rotary
Toggle, Packet
Multi-Circuit
Snap-ins and
Thermostats

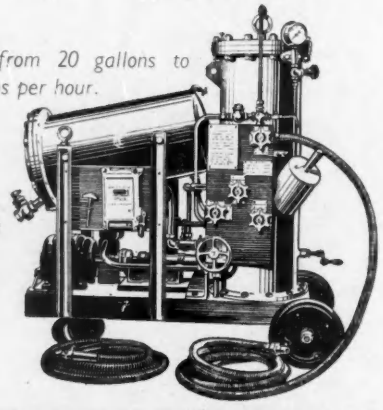
"DIAMOND H" SWITCHES LTD
GUNNERSBURY AVENUE, CHISWICK, LONDON, W.4
Telephone: **CHISWICK 6444/6/7/8**



TRANSFORMER AND SWITCH OILS

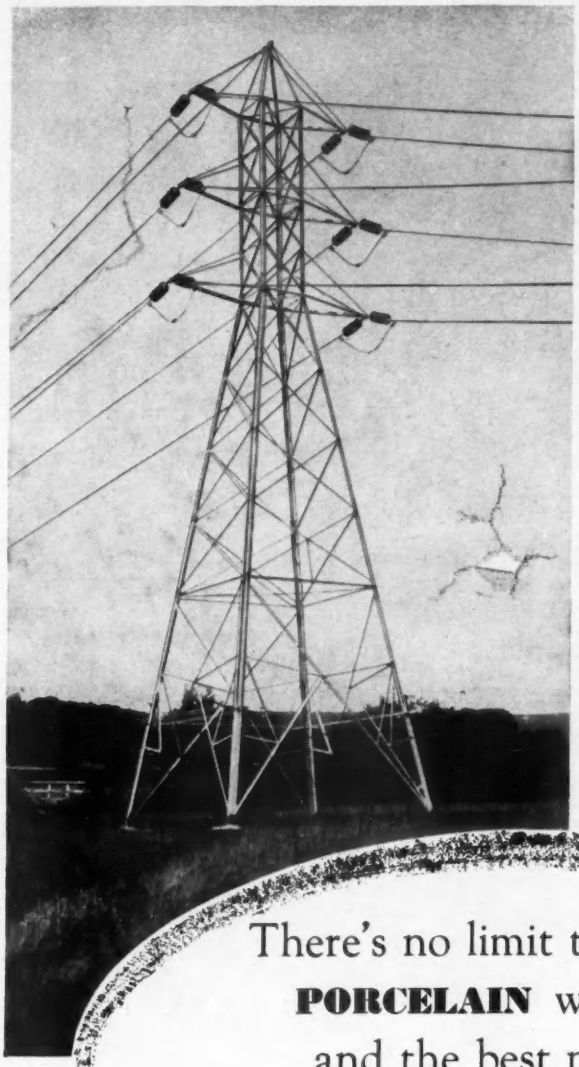
Complete Drying and Purification giving Maximum Breakdown Voltage in one simple operation. No heating. No fire risk. Weatherproof. Fully mobile units. Used by leading Electricity Undertakings throughout the World.

Capacities from 20 gallons to 1,000 gallons per hour.



METAFILTRATION

THE METAFILTRATION COMPANY LIMITED
BELGRAVE ROAD, HOUNSLOW, MIDDLESEX
PHONE: HOUNSLOW 1121/2/3
GRAMS: METAFILTER, HOUNSLOW



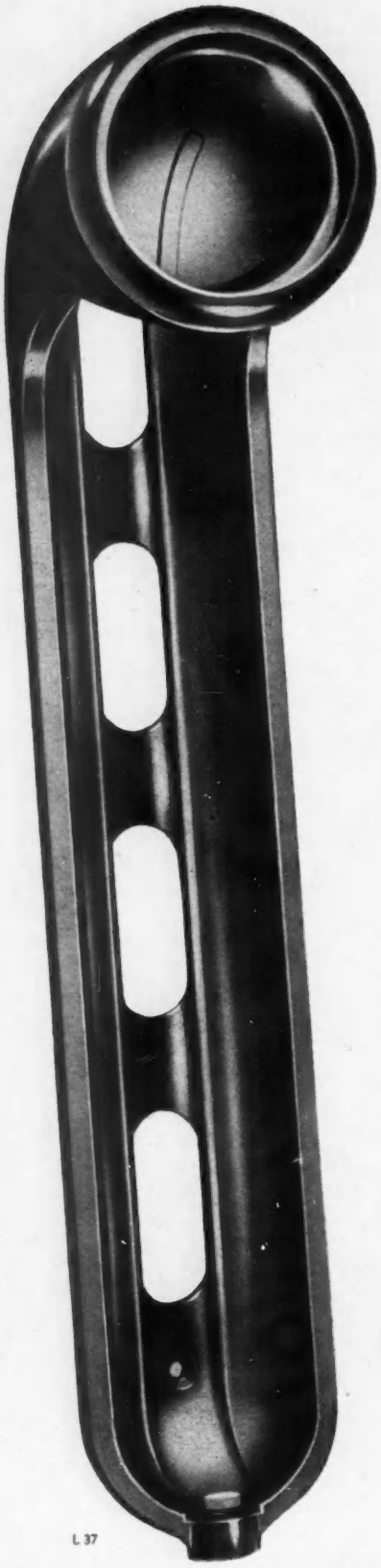
The photograph shows T.T. porcelain Cap and Pin Insulators on one of the first 66 kV Overhead Lines to be erected in the British Isles—a line from Maentwrog to Wrexham which is still in use after a quarter of a century.

Taylor Tunnicliff & Co, Ltd. will also supply the Insulators for the latest B.E.A. 275 kV Super Grid Line from Iver via Weybridge to Melksham. (Main Contractors: Balfour Beatty Co. Ltd., London.)

There's no limit to the **TIME**
PORCELAIN will **LAST**
and the best porcelain
is made by
Taylor Tunnicliff

TT
PORCELAIN

TAYLOR TUNNICLIFF & CO. LTD.
Head Office : EASTWOOD, HANLEY, STAFFS.
Telephone : Stoke on Trent 5272-4
London Office : 125 High Holborn, W.C.1
Telephone : Holborn 1951



L 37

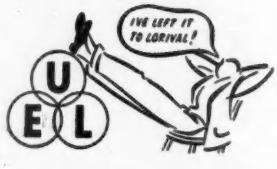
They're lively lads at Lorival

You wonder whether something can be moulded? Or you're convinced that it can't be? Ask Lorival. They'll do it if it is at all practicable. Moreover, they'll do it with unsurpassed polish. And their service is first-rate: pleasing design, keen prices, and rapid delivery. Leave it to Lorival.

In this case EBONITE was selected as the most suitable material for this Billiards Pocket for E. J. Riley Ltd., because of its strength and shock-resisting qualities. Original tool design enables the pocket to be moulded in one piece, including the undercut ring and elbow. Soft rubber strips on the bend of the elbow, and a soft rubber pad at the end of the channel section minimise noise in service.

LORIVAL PLASTICS

UNITED EBONITE & LORIVAL LTD.,
LITTLE LEVER, NR. BOLTON, LANCS



The M.W. Range of Switch Fuses includes Double Pole, Double Pole with Single Pole fuse, Triple Pole, Triple Pole and Neutral, each series being available from stock for 15, 30, 60 and 100 amperes rating. Either cartridge fuse links (H.R.C.) or semi-enclosed (re-wirable) type fuses can be used.

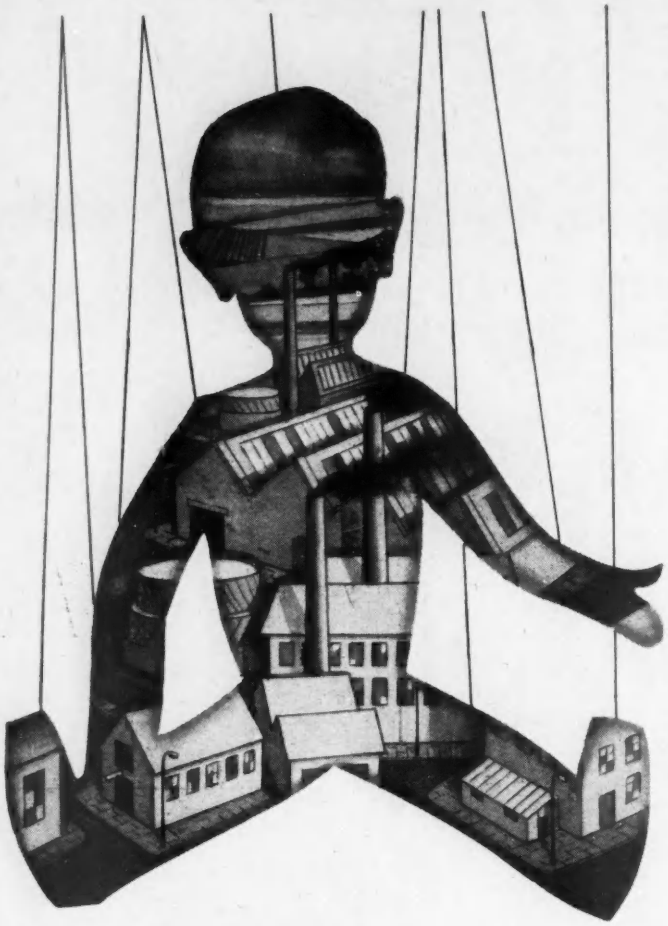
THE M.W. RANGE. Are you aware of the many important features of the M.W. Range of Switchgear?

Take switch fuses for example. Do you know the six vital points to look for in a good switch fuse? This information is given in the above publication.

If you have not received your copy please let us know so that we may send you one now.

G.E.C.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2



The supply of power to industry . . .

Since 1895 . . . The Supply of Power to Industry by electricity has depended upon the safe and enduring qualities of the electric cables. Well known to engineers for their superb performance and reliability CONNOLLYS' Paper Insulated Power Cables have "grown-up" with the mighty giant of Electric Power. Many Area Electricity Boards, Collieries and Railways rely on CONNOLLYS' Cables knowing that in our modern factory we, ourselves, carry through every stage of manufacture from wire-drawing, to final testing.

CONNOLLYS' Paper Insulated Power Cables are produced to British Standards and other specifications from 660 to 11,000 volts. Special finishes can be manufactured to customers' own requirements.

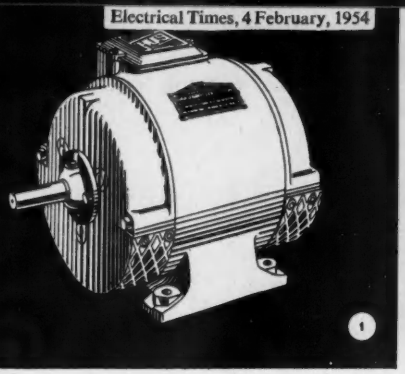
CONNOLLYS
BLACKLEY (LIMITED)

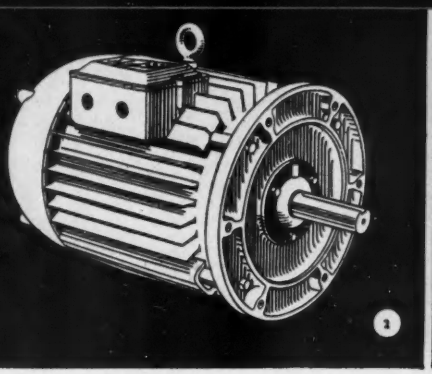
Founder members of the C.M.A.

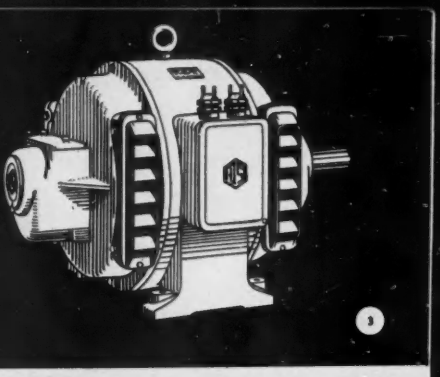
HEAD OFFICE: MANCHESTER 9
Phone: CHEetham Hill 1801 **Grams: "Connollys Blackley"**

London Office:
34 Norfolk Street, Strand, W.C.2
Tel: TEMple Bar 5506

Birmingham Office:
15-17 Spiceal Street, BIRMINGHAM 5
Tel: Midland 2268


1

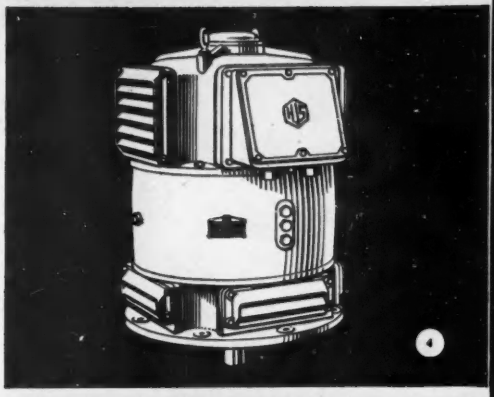

2

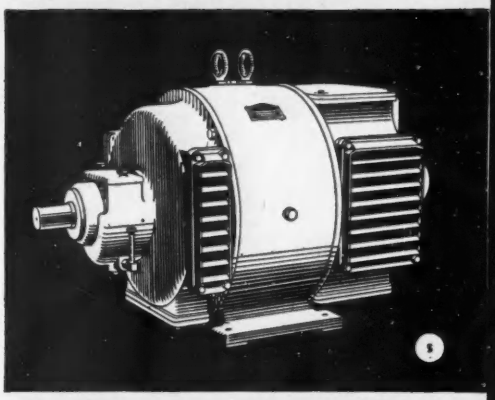

3

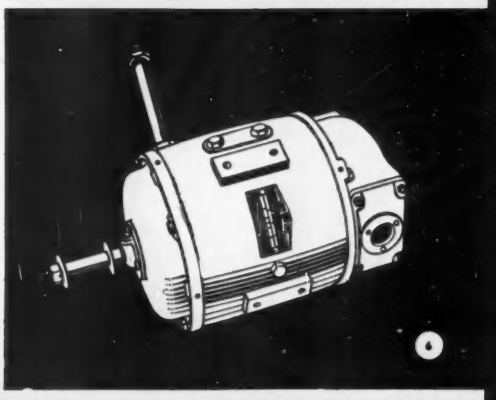
A.C. & D.C.
MOTORS AND GENERATORS

Backed by 53 years Manufacturing Experience

1. SQUIRREL CAGE SCREEN PROTECTED DRIP-PROOF A.C. MOTOR.
2. TOTALLY ENCLOSED SURFACE COOLED FLANGE MOUNTING MOTOR.
3. DRIP-PROOF RING OILING STEERING GEAR MOTOR.
4. VERTICAL PUMP TYPE DRIP-PROOF D.C. MOTOR.
5. HORIZONTAL RING OILING DRIP-PROOF D.C. MOTOR.
6. TOTALLY ENCLOSED FAN AIR STREAM D.C. MOTOR.
7. T.E. HORIZONTAL BALL BEARING TYPE FAN MOTOR.
8. HORIZONTAL RING OILING FLANGE MOUNTING FAN MOTOR.
9. DRIP-PROOF BALL BEARING TYPE D.C. MOTOR.


4


5

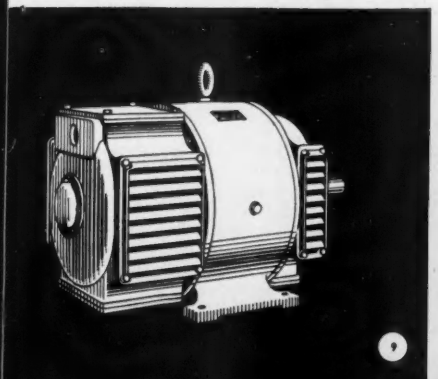

6

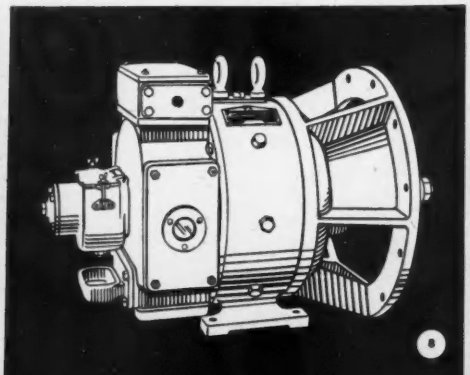
Scott H.J.S. *OF NORTHERN IRELAND*

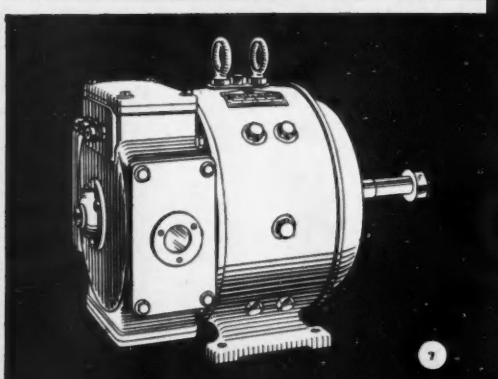
MANUFACTURERS OF
½-200 H.P. A.C. MOTORS · ½-200 H.P. D.C. MOTORS
1-125 K.V.A. ALTERNATORS · ½-150 K.W. GENERATORS
GEARED MOTORS
MOTOR GENERATOR SETS · INVERTED ROTARY CONVERTERS

HUGH J. SCOTT & CO (BELFAST) LTD

VOLT WORKS BELFAST N. IRELAND


9

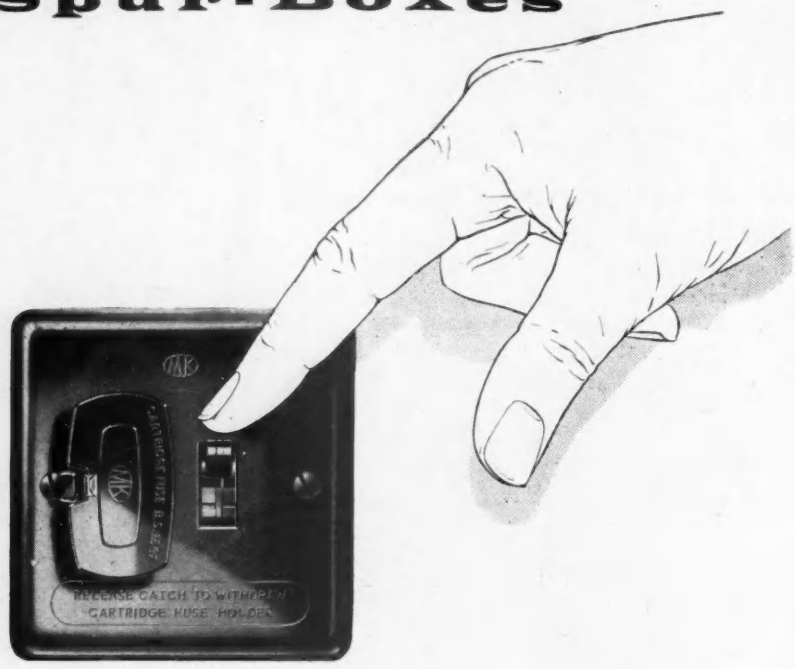

8


7

MK84A
DHB

NEW

Fused Spur-Boxes



— *now switched as well as unswitched*

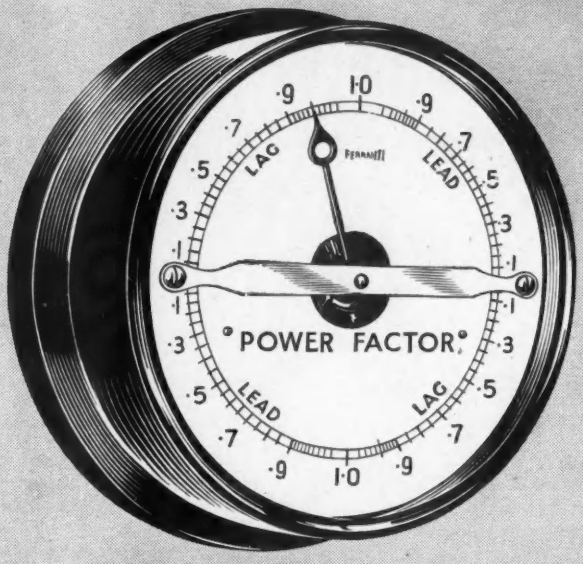
MK fused spur-boxes are already well-known and widely used. Now we introduce new designs incorporating single pole isolating switches. The switched fused spur-box provides by far the most economical and satisfactory means of installing a fixed appliance with additional means of disconnecting it from the live conductor. Leaflet 226 describes the spur-boxes in detail.

MK . . *the mark of safety*

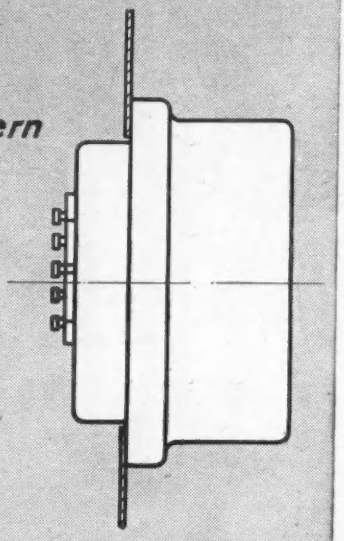
M.K. Electric Limited, Wakefield Street, London N.18 Edmonton 5151

POWER FACTOR METERS

NEW DESIGN · COMPACT
GOOD DELIVERY



Round Pattern



FERRANTI

This is one of the new Ferranti Power Factor Meters. Shallow pressed steel case. Balanced or unbalanced load. Small V.A. burden. 4″, 6″ or 8″ round or square dial, semi-projecting or flush mounting. Other recently designed Ferranti switchboard instruments with features similar to the above include ammeters, voltmeters, wattmeters and frequency meters. All types are also available in hermetically sealed cases.

FERRANTI *Switchboard Instruments*

FERRANTI LTD · HOLLINWOOD · LANCS · ENGLAND

London Office: KERN HOUSE, 36 KINGSWAY, W.C.2

FI123

FAIR PLAY

SWITCH BLOCKS
built of* KILN DRIED *timber
STAY FLAT
AND CORRECT SHAPE

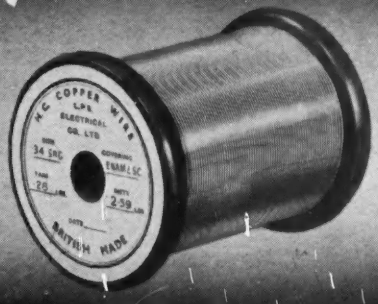
We invite your enquiries

WOOTTON & CO. LTD.

ALMA WORKS, PONDERS END
MIDDLESEX
TELEPHONE: HOWARD 1858

Dependability

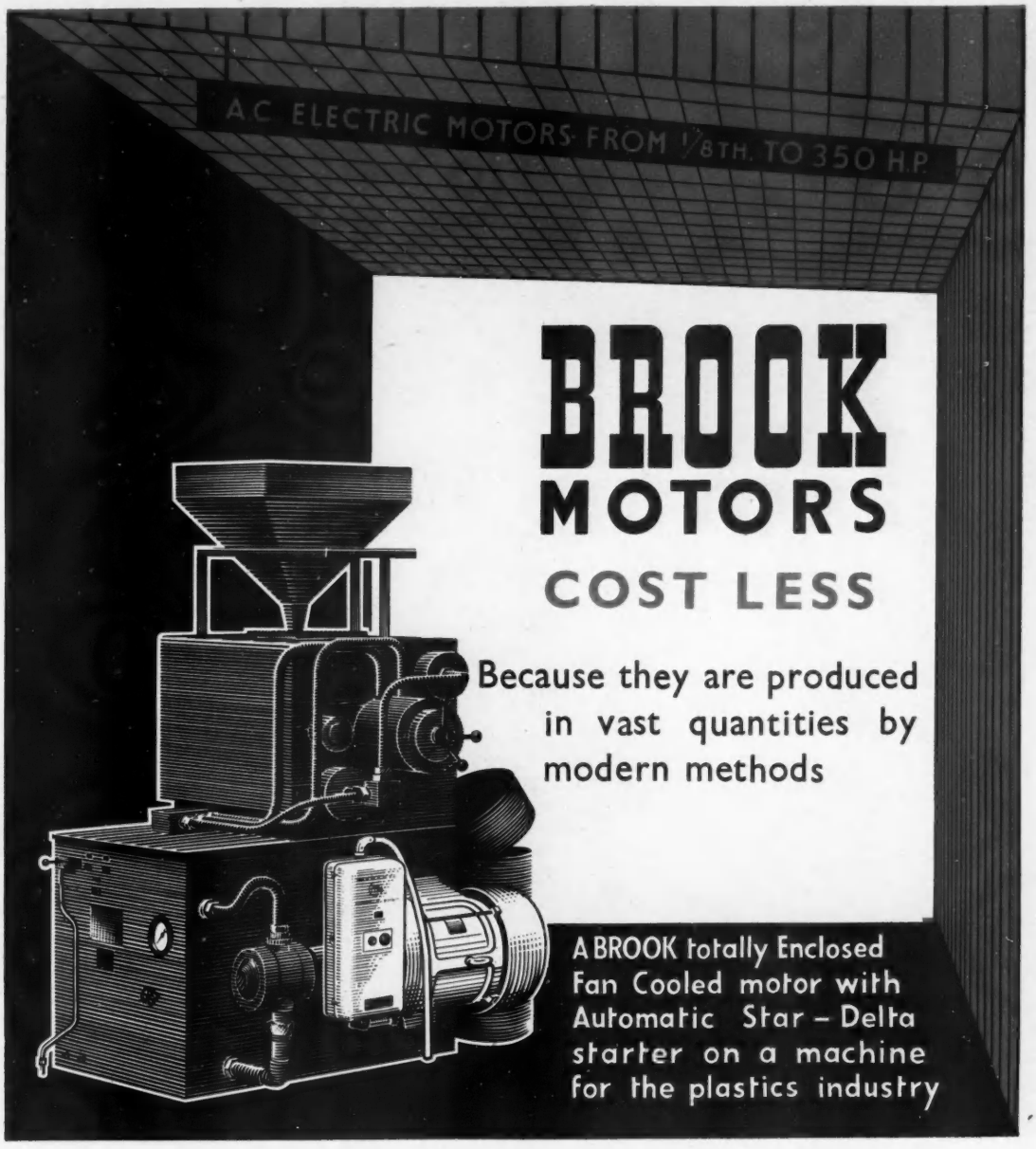
INSTRUMENT WIRES
STRANDS & BRAIDS



TELEPHONE & RADIO CORDS
CABLES & FLEXIBLES

LPS
ELECTRICAL CO.LTD

ALPERTON WEMBLEY MIDDLESEX
TELEPHONE : PERIVALE 5621-4 TELEGRAMS : ENGINEYOR PHONE LONDON


A.C. ELECTRIC MOTORS FROM 1/8TH. TO 350 H.P.
BROOK
MOTORS
COST LESS
Because they are produced in vast quantities by modern methods
A BROOK totally Enclosed Fan Cooled motor with Automatic Star – Delta starter on a machine for the plastics industry

"In the plant installations we have been carrying out, we have recommended and installed your motors as we have every confidence in them."

A recommendation from a leading contractor.

BROOK MOTORS LIMITED
HUDDERSFIELD • ENGLAND

1904·FIFTY YEARS OF ELECTRIC MOTOR MAKING·1954

B*

I.ND.304.

ELLIOTT

Electrical recording and measuring instruments

HIGH-SENSITIVITY RECORDER (Type 230)

A moving coil instrument of robust, compact construction, extensively used by the General Post Office, British Electricity Authority and other undertakings throughout the world. Available also in portable form (weight only 24 lb).

Adjustable maximum and minimum contacts can be fitted for operating alarms and regulating units.

Elliott type 230 *Recorders are fitted with* 3″ *continuous charts.*

SWITCHBOARD MEASURING INSTRUMENTS

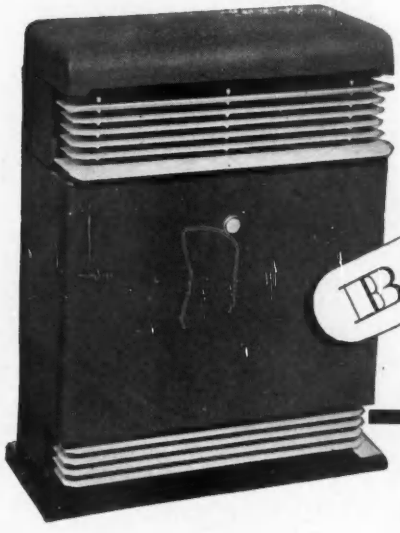
ELLIOTT round pattern, moving iron instruments are available in 4″, 6″ and 8″ sizes for projecting or flush mounting. Cases are of pressed steel. Movements are fully jewelled and efficiently damped for quick response and "dead-beat" action.

PROMPT DELIVERY FOR PREFERRED RANGES

ELLIOTT BROTHERS (LONDON) LTD., CENTURY WORKS, LEWISHAM, S.E.13 Phone: TIDeway 3232

WARM Air of Efficiency

★ ***Ultra safe, ultra smart and ultra efficient . . . the B.N.E. Model P.20 Convector.***



The stimulating comfort of the convector-warmed waiting room . . . the efficiency of the office warmed *before* staff arrive by a time-switch controlled Convector . . . the smart appearance of the latest B.N.E. Model P.20—these are the selling points that can bring you profits. Your latent customers may not realise the advantages of the electric convection heater with its automatic thermostat and facility for time-switch control. Tell them! Show them how *they* will benefit. There is a lot of business among shopkeepers and professional and business men if you back your story with the smart B.N.E. Convectors. P.S. If you are interested in a mailing scheme, we would like to co-operate with you. Write to us for details.

B·N·E

Convector Heaters

BRITISH NATIONAL ELECTRICS LTD.

The Domestic Appliance Section of JOHNSON & PHILLIPS LTD.

NEWARTHILL - MOTHERWELL - SCOTLAND

For Industrial and Laboratory Use

All types of A.C. apparatus — motors, furnaces, rectifiers, transformers — can be controlled by a single Regavolt whose output can be set, regardless of the load current, precisely at any voltage from 0 to 30% above the supply. Its rugged design for heavy industrial duty ensures reliability under severe working conditions.
Special designs can be made for incorporation in your own apparatus in addition to the wide range of single, 3 phase, hand and motor driven models listed in our catalogue No. 3131.

HIGH EFFICIENCY — COMPETITIVE PRICE

DELIVERY FROM STOCK

BERCO

"REGAVOLT"

REGULATING TRANSFORMER

THE BRITISH ELECTRIC RESISTANCE CO. LTD.

Specialists in the control of current and voltage for more than 25 years

Queensway, Ponders End, Middlesex. Telephone: HOWard 1492. Telegrams: Vitrohm, Enfield.

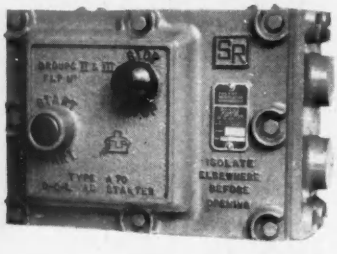
BR. 3131/AH

FLAMEPROOF

Buxton Certified

CONTROL GEAR

FLP



New list now available

- Starters for A.C. and D.C. Motors
- Push Button Stations.
- Shunt Regulators, Resistances, etc.
- Limit Switches

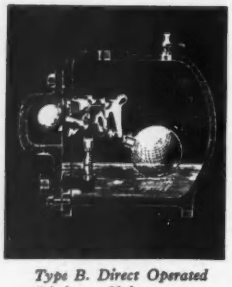
SR

SOLENOIDS & REGULATORS LTD.

268-270 MOSELEY RD., BIRMINGHAM, 12

Tele: CALthorpe 0532 Grams: Solenoid, Birmingham

Trap your heat



Type B. Direct Operated Discharge Valve

in BRADFORD STEAM TRAPS

Fuel is too expensive to waste. Every thermal unit must be converted into energy. Bradford Steam Traps ensure efficient use of steam and heat. Instantaneous opening and closing action prevents damage to valves and seats. There is a "Bradford" trap to suit all steam pressures.

Every trap fully tested and guaranteed.

United States Metallic Packing
COMPANY LIMITED

SOHO WORKS, BRADFORD, YORKSHIRE Tel. 41284-41285

Branch Offices:
London, Liverpool, Bolton, Newcastle, Cardiff, Southampton.

POWER TRANSFORMERS

1000 kVA & 500 kVA, 3-phase, transformers, voltage ratio 3300/433, connected delta/interstar.

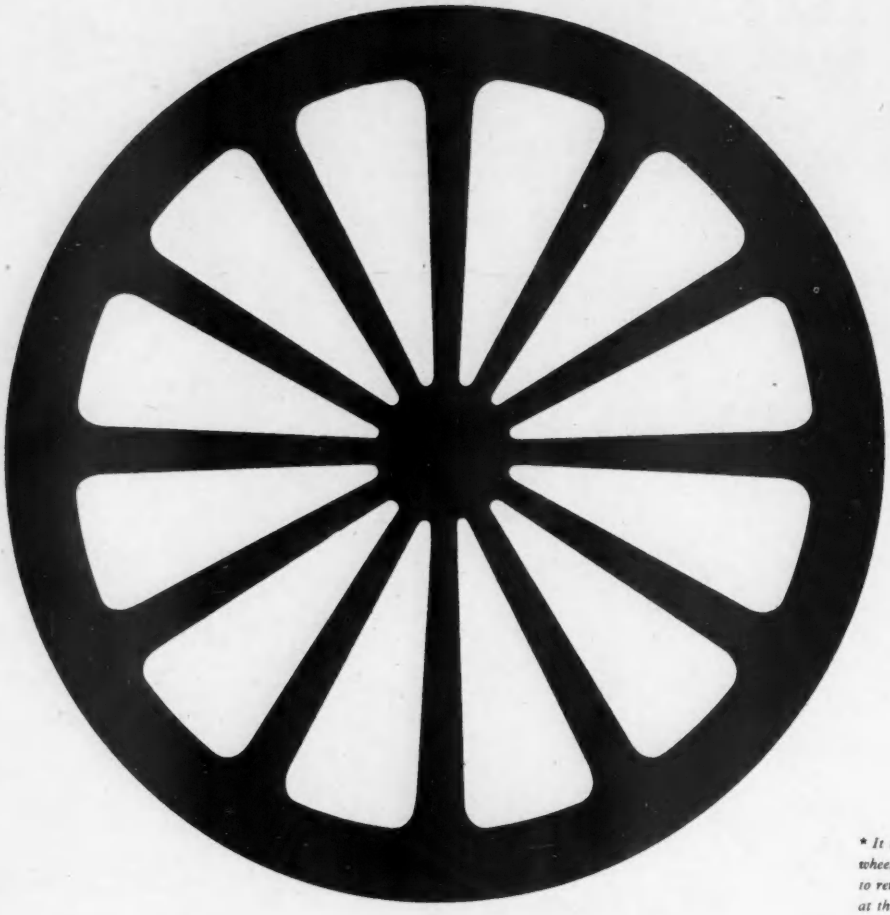
A number of the distribution transformers (two of which are illustrated here) in use at the Wilton Works of Imperial Chemical Industries Limited, were supplied and transported by :

THE LINDLEY THOMPSON
TRANSFORMER AND SERVICE CO. LTD.

ST. MARY'S ROAD, MIDDLE GREEN, SLOUGH, BUCKS

Tel. LANGLEY (BUCKS) 200/201

A lot of spokes in our wheel*



** It is unnatural for any wheel connected with Crompton Parkinson to remain still. Blink steadily at this one and watch it revolve.*

...but none in yours

Within the seventy-five year old Crompton Parkinson organisation are a number of separate entities. Each is responsible for the manufacture of an essential piece of electrical plant—each is a vital spoke in a mighty wheel that, in turn, keeps the wheels of your industry turning. Yet each entity, though complete in itself, is but part of a common whole — the Crompton Parkinson service to a modern world.

When it comes to electrical equipment... you've got to

hand it to Crompton Parkinson LIMITED ELECTRICAL EQUIPMENT

MAKERS OF ELECTRIC MOTORS OF ALL KINDS · ALTERNATORS · GENERATORS · SWITCHGEAR · B.E.T. TRANSFORMERS · CABLES

INSTRUMENTS · LAMPS · LIGHTING EQUIPMENT · BATTERIES · STUD WELDING EQUIPMENT · TRACTION EQUIPMENT

CROMPTON PARKINSON LIMITED · CROMPTON HOUSE · ALDWYCH · LONDON · WC2 · TELEPHONE: CHANCERY 3333

In Melbourne . . .

Melbourne (Australia) showing Revo "Silverblue" lanterns for 400 watt mercury lamps illuminating Swan Street Bridge. (Photograph by courtesy of Melbourne City Council Electricity Supply Department.)

and in Macclesfield . . .

Macclesfield (Cheshire) showing Revo C.13723 lanterns for 140 watt sodium lamps mounted on Revo "Scopas" concrete columns. (Photograph by courtesy of the Borough Engineer, J. H. Dossett Esq., A.M.I.C.E., A.M.I.W.E.)

REVO
REGD.

lights the way . . .

. . . and in countless other towns and cities throughout the world Revo equipment has been specified for some of the most important street lighting installations — a fitting tribute to their high standard of manufacture and lighting efficiency.
Send us YOUR enquiries — we shall be pleased to help you.

REVO ELECTRIC CO. LTD., TIPTON, STAFFS.

Branches at: LONDON, GLASGOW, MANCHESTER, CARDIFF, NEWCASTLE-ON-TYNE, LEEDS, BELFAST, DUBLIN

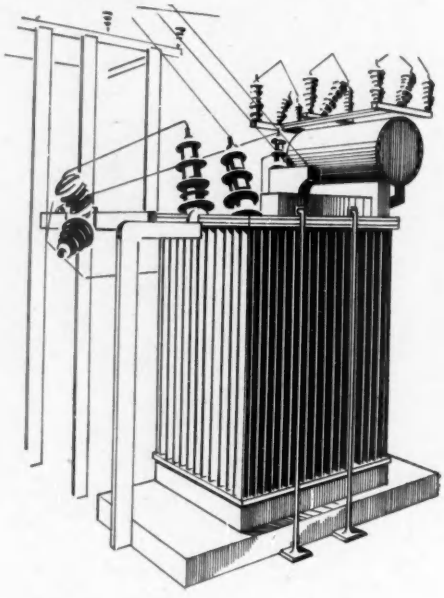
ZENITH
(REGD. TRADE-MARK)
CERAMIC
EMBEDDED RESISTORS
of the highest quality complying with all Government Specifications.
★ Unsurpassed in the construction of Radio and Television Receivers.
Illustrated brochure free on request.
THE ZENITH ELECTRIC COMPANY LTD.
ZENITH WORKS, VILLIERS ROAD, WILLESDEN GREEN, LONDON, N.W.

A Joint to forget Material to Remember

NEO-K-TEX

- GASKETS
- WASHERS
- SHEETS
- MOULDINGS

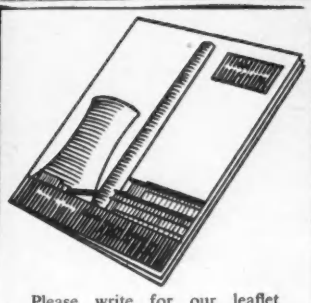
RESISTANT TO OIL, PETROL, WATER AND MOST INDUSTRIAL SOLVENTS



KAUTEX LTD. ELSTREE WAY · ELSTREE · HERTS · Tel. ELSTREE 1777-8-9

99·4% efficiency achieved in flue dust precipitation

The first Simon-Carves flue dust electro-precipitators at the new Huncoat power station were commissioned in 1952. They operate in conjunction with pulverized fuel fired boilers of 305,000 lbs/hr continuous maximum rating. After six months' continuous operation an official test at full boiler load was carried out without preliminary cleaning of either the boilers or the precipitators. The guaranteed efficiency was 98%. *The efficiency actually recorded under these exacting conditions was* 99·4%.



Please write for our leaflet (CPP 1) on high efficiency boiler flue dust precipitation.

High-efficiency flue dust precipitation by **Simon-Carves Ltd**

SIMON ENGINEERING GROUP

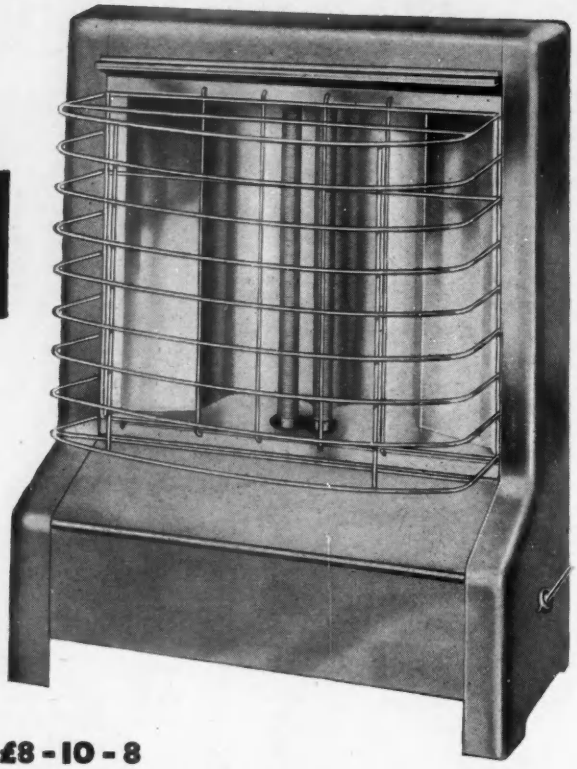
STOCKPORT ENGLAND

OVERSEAS COMPANIES ***Simon-Carves (Africa) (Pty) Ltd: Johannesburg Simon-Carves (Australia) Pty Ltd: Sydney***

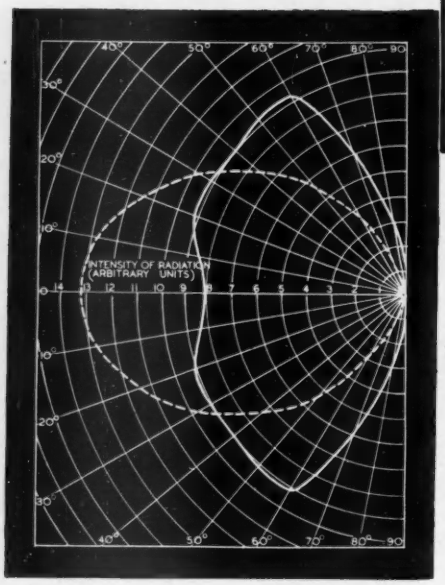
S.C. 95

Know your Goods!

D2811G, 2000 watts



£8-10-8
including REDUCED purchase tax



Distribution of Radiation in a horizontal plane

——— Fires with wide angle reflector

– – – – – – Fires with ordinary reflector

MULTI-PARABOLA means more heat for everyone

1. Scientifically designed reflector disperses heat evenly.
2. Heat rays, directed into the room at all angles, ensure comfortable heating over a wide area.
3. Pleasing design and brilliant finish give these fires a very handsome appearance.
4. Models to blend with every type of interior—lounge, bedroom, nursery, etc.
5. All G.E.C. Fires are fitted with safety guards and comply with the safety requirements of British Standard Nos. 1670 and 1945.

These facts sell G.E.C. MULTI-PARABOLA FIRES

The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2

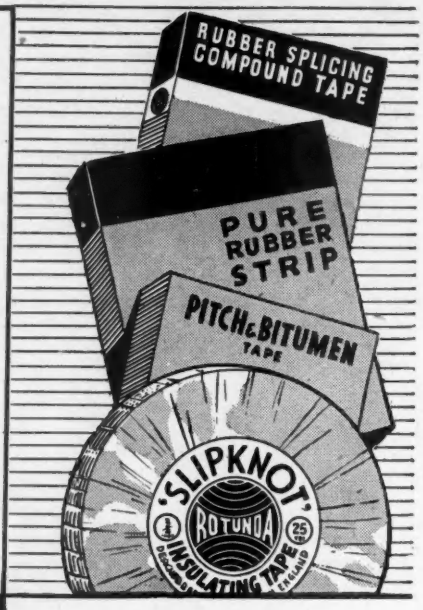
LIGHTING

In Banks, as in all buildings in which sudden darkness can impose the risk of theft, emergency lighting is a necessary precaution. In bank buildings of the future the standby electrical system will be planned at the same time as the main lighting is planned. Chloride Batteries Ltd, makers of Keepalite, the automatic emergency lighting system, offer the advisory services of their engineers to architects and electrical contractors in any part of Britain.

Keepalite
FOR BANKS

A Product of Chloride Batteries Limited, Exide Works, Clifton Junction, Swinton, Manchester and Grosvenor Gardens House, Grosvenor Gardens, SW1

DON'T RISK 'LEAKAGE'!

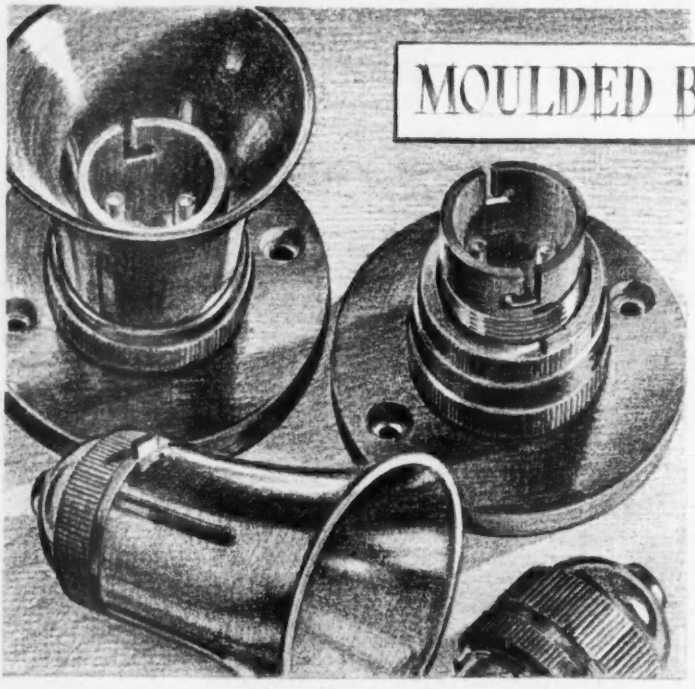


Take no chances-use

ROTUNDA

INSULATING TAPES

ROTUNDA LIMITED DENTON MANCHESTER



MOULDED BAYONET HOLDERS

by Sperryn TRADE MARK

A complete range of Batten, C.T.S., Skirted, Conduit, Switch and Flexible lampholders are available complying with B.S.52

for Efficient Electrical Accessories of Quality

"Specify Sperryn"

SPERRYN & CO. LTD., MOORSOM STREET, BIRMINGHAM 6

LONDON OFFICE:
23 GREAT SUFFOLK STREET, S.E.1

DUCTUBE

Saves

LABOUR & MATERIALS

ON ELECTRICAL INSTALLATIONS

And IS NOW AVAILABLE FOR HIRE

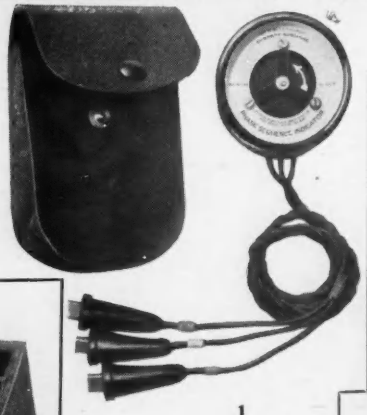
Send FOR OUR FREE BROCHURE & HIRING RATES OR ASK FOR AN ENGINEER TO CALL

DUCTUBE Company Limited
REGENT HOUSE · 235-241 REGENT ST · LONDON · W·1
Telephone REGENT 2592/3/4

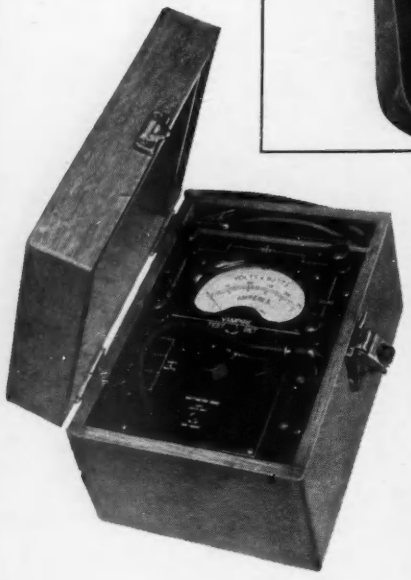
Portable TEST INSTRUMENTS

2

An indication of the range of portable instruments manufactured by Everett Edgcumbe



1



4

3

1. Phase Sequence Indicator (Catalogue Sheet 261E)
2. Auto Photometer (Catalogue Sheet 464E)
3. Hum Metrohm Insulation and Conductivity Tester (Catalogue Sheet 242E)
4. Vampire A.C. Test Set (Catalogue Sheet 237E)

EVERETT EDGCUMBE

Designers and manufacturers of almost every type of electrical indicating and recording instrument.
Specialists in : Speed recording—Photometry—Process Time Control—Telemetering

COLINDALE WORKS LONDON N.W.9 TELEPHONE: COLINDALE 6045

DHB

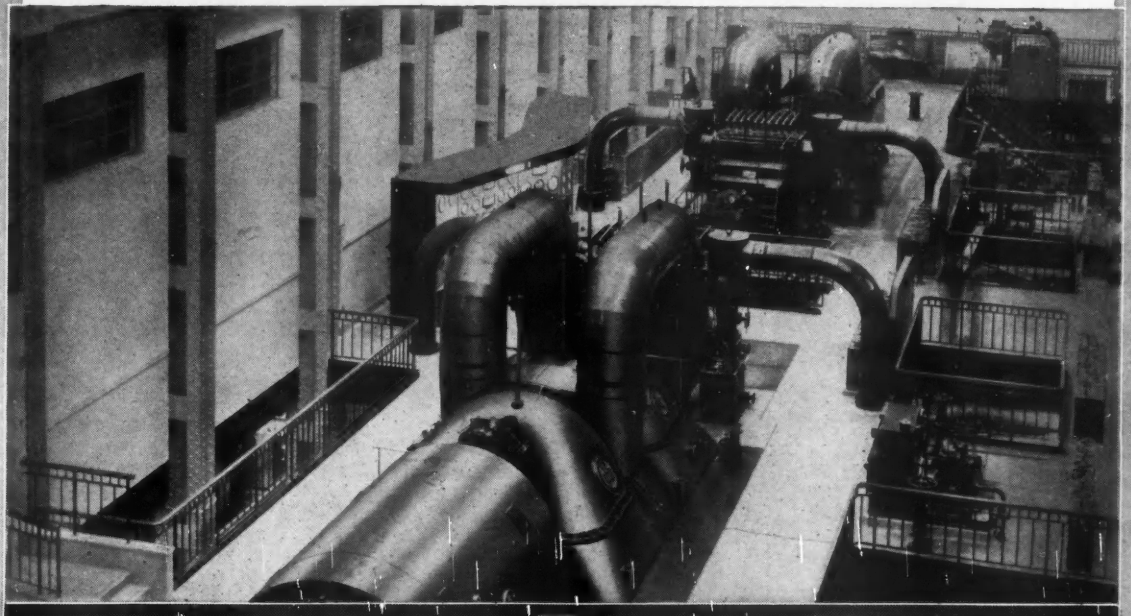
TURBO-GENERATORS

by

B T-H

Power stations throughout the world are equipped with steam turbines and generators made by BTH, who hold a leading position as designers and manufacturers of some of the largest machines installed.

At the Kingston-on-Thames Station of the British Electricity Authority, five BTH turbo-alternators–four 30,000 kW., and one 3,000 kW. (house-service set)—are providing a generating capacity of 123,000 kW.



THE

BRITISH THOMSON-HOUSTON

COMPANY LIMITED, RUGBY, ENGLAND

Member of the AEI group of companies

A4258

BRUSH

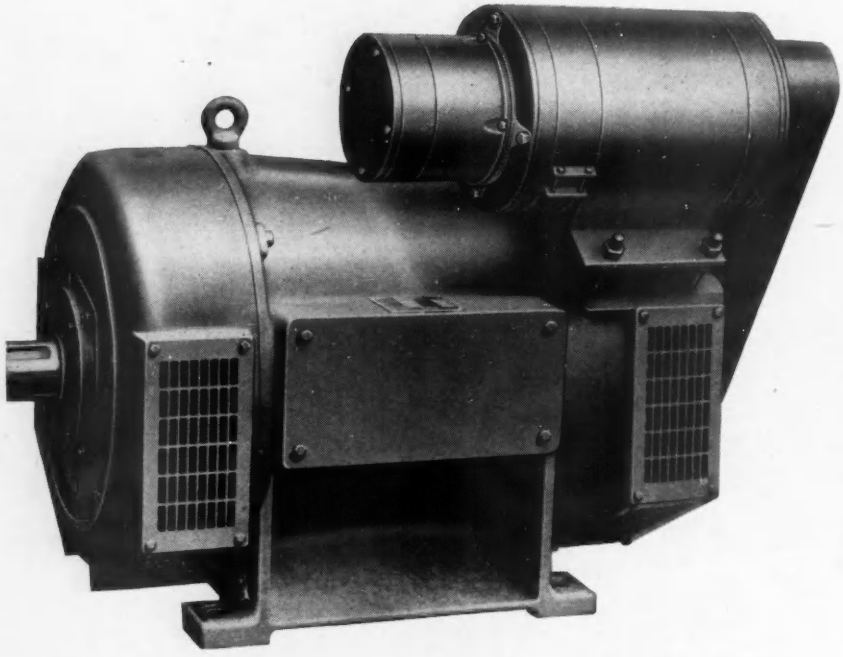
introduce

SELF-REGULATING ALTERNATORS

with "Amplidex" system of control

(PAT. APPLIED FOR)

These alternators, available in sizes up to 150kW (foot or flange mounting) give you better performance at lower overall costs on these main counts:—



- ★ **No automatic voltage regulator needed**
- ★ **Voltage regulation ± 2½ per cent for all conditions of loading, temperature and power factor**
- ★ **Very rapid response with change of load**
- ★ **Parallel operation with similar machines or conventional alternators**
- ★ **Heavy load surges taken with minimum transient voltage change**
- ★ **Control between 50 and 60 cycles over normal voltage range**

Write NOW for Special Publication No. SRA/1

THE BRUSH ELECTRICAL ENGINEERING CO. LTD., LOUGHBOROUGH, ENGLAND

BIRMINGHAM · BRISTOL · CARDIFF · GLASGOW · IPSWICH · LEEDS · LONDON · MANCHESTER · NEWCASTLE · SHEFFIELD

B 35

First in the World

METROVICK TRANSVA METER FOR

Direct measurement of kVA m.d.

- Employs an integrating meter of the conventional pattern with no additional gears or moving contacts.
- **Measures accurately at all power-factors (leading or lagging) and with load unbalanced.**
- Is unaffected by normal variations in voltage, frequency and temperature.
- Can be supplied for kVAh and/or kVA demand.
- Can be fitted with transmitting or alarm contacts.
- Less difficult to test than ordinary polyphase watthour meters.

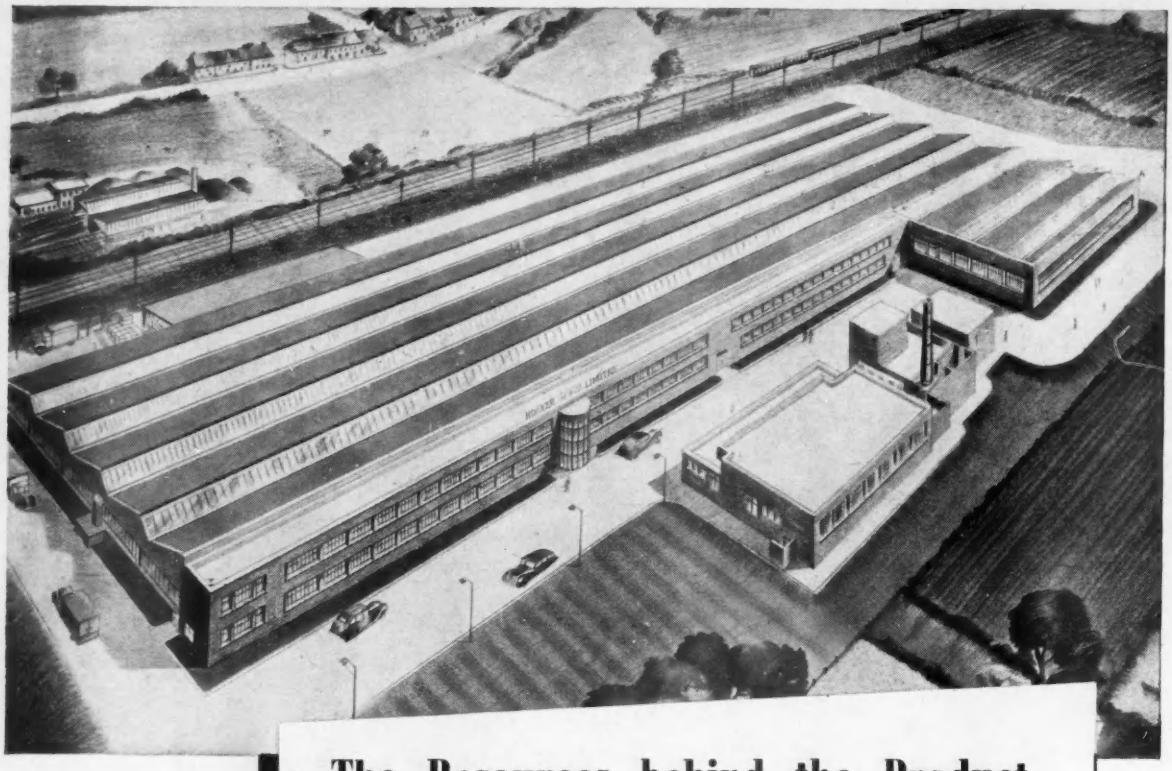
Write for leaflet 356/11-1.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the A.E.I. group of companies

For Meticulous Metering

G/A303



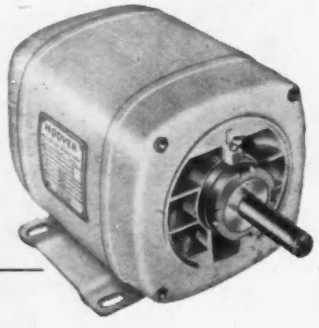
The Resources behind the Product

Hoover Limited at Cambuslang, Scotland

THROUGHOUT the industrial world, Hoover Limited have won recognition for manufacturing F.H.P. motors of exceptional quality and dependability. This reputation has been gained by bringing together all their wide technical experience and endless engineering resources with one aim in sight — the finest possible F.H.P. motors.

Hoover motors combine complete reliability with a competitive price and are backed by a world famous service plan.

Of course, Hoover Limited also manufacture F.H.P. stator rotor units which have applications in many modern industries today.



For the name and address of your nearest distributor write to:

Hoover Limited

INDUSTRIAL PRODUCTS DEPARTMENT

CAMBUSLANG · LANARKSHIRE · SCOTLAND

ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 4 FEBRUARY, 1954
Volume No. 125 Number 3248
REGISTERED AS A NEWSPAPER

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2.

Telephone: HOLborn 6016
Telegrams: Equivolt, Estrand

Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Assistant Editors:
J. K. JOHNSON, B.SC.(ENG.), A.M.I.E.E.
K. C. POUNDS, B.SC.(ENG.), A.C.G.I., A.M.I.E.E.

In This Issue

Generation of Electricity in Thunder-Storms, by *B. J. Mason*, M.SC. 159
Drying Out Transformers 163
Cables and Caravans 164
Readers' Views 165
Corrosion of S.C.A. Lines 166
Around the Trade, by *Peregrin* 169
Hydro Power in Canada 170
E.L.M.A. Activities in 1953 171
Contractors' Viewpoint 172
Research on Diesels 174
Seeboard Use a Simple Post Hole Borer for Rural Lines 175
Overseas News 176
Personalities in the Industry 178
Equipment for Industry 180
For the Electrical Trade 181
Problems and Practice in Engineering ... 182
News of the Week 183
Electric Supply News 187
Questions in Parliament 187
Company Activities 188
Commercial Information 189
Classified Advertisements 41
Index to Advertisers 48

SUBSCRIPTION RATES

United Kingdom and Overseas £2. 10s. 0d. per annum. Canada $7.50. U.S.A. $7.50 per annum. Subscriptions are payable in advance and may commence with any issue throughout the year. Overseas subscriptions may be paid to The Electrical Times Limited by banker's draft, cheque or international money order. Single copies price 9d. each.

C

NATIONAL MINIMUM FOR WIRING

It is stated quite clearly in the 1937 Electricity Supply Regulations, that any consumer's installation which complies with the I.E.E. Wiring Rules fulfills the requirements of the Supply Regulations, under which an Undertaker may be compelled to give a supply. However, there is quite properly no suggestion in the 1937 Regulations that an installation conforming to the I.E.E. Rules is the only one suitable for connection: the Wiring Rules inevitably fall short of acting as an exclusive code of acceptable practice for every situation which can arise in installation work. For the more general case, there are broad requirements set out in the 1937 Regulations, of which the key phrase is that requiring apparatus to be "constructed, installed and protected so as to prevent danger so far as is reasonably practicable." What an opportunity for varied interpretations! —and so it proves, with a long history of grumbling about inspectors' rulings as a feature of the story of electricity supply. The 1947 changes in the structure of the industry gave the question a new twist. Uniformity, at least within board boundaries, became obviously desirable, and a start was made with the formulation of minimum codes for acceptable installations. The possibility at once arose of as many as 14 Codes of installation requirements, all additional to, and inevitably in some degree competitive with the universally respected I.E.E. Wiring Rules. This would have benefited no-one, and there will be a general welcome for the announcement made last week by the President of the I.E.E., that by friendly agreement with the interests concerned, the Institution is proposing that the Wiring Rules in their thirteenth edition should be completely recast so as to comprise a segregated "essential requirements" section which can serve as a universal inspection code, together with a revised version of the existing descriptions of approved practice, which will, of course, in most cases be the best method of fulfilling the segregated requirements. In meeting this well defined need, the Institution is doing a valuable service to the industry in this country and also in the many lands overseas where the I.E.E. Wiring Rules are used. There is, however, one plea we would make. This new Part 1 of the Rules will doubtless need interpretation, and, as usual, the Wiring Rules Committee of the Institution will be appealed to for decisions. At the same time when the Rules are drawn up, it would be a most helpful move to set up machinery for the speedy promulgation of such decisions so that the inevitable vagaries of local interpretation can be firmly suppressed, and the wireman, whether he works in Durham or Dartmouth, knows the minimum standard he has to satisfy.

COUNTERACTING LINE CORROSION

When the decision was originally taken to use steel-cored-aluminium overhead line conductors for the 66 and 132 kV networks it was estimated that an average life of about 25 years could be anticipated. This figure has proved reasonably correct, and as the earlier constructed lines are nearing this limit, a major task of replacement will have to be faced within the next few years. With 6,500 circuit miles of main transmission lines in operation anything that can be done to inhibit the corrosion which limits the life of the lines is obviously of importance, and we heard something of the steps being taken to this end in a paper by Dr Forrest and Mr Ward on the corrosion of s.c.a. conductors. In industrial areas the life of a line may be less than ten years while in rural areas many conductors are in excellent condition after twenty years' operation and may be expected to last at least fifty years. At the moment, the major attack on corrosion is the coating of lines with some form of grease. The added expense of this method due to handling and erecting difficulties is, however, a counteracting factor, but some such form of protection would appear essential where the attack is primarily due to atmospheric pollution. There is, however, a further serious form of corrosion, electrolytic in nature, which is particularly in evidence in coastal districts where salt spray may be deposited, affecting ultimately the internal surfaces of the inner aluminium layer. A suggestion was made by Dr Evans, of Cambridge University, that the spraying of zinc on the conductors or the introduction of a zinc paste, might be effective in nullifying the complex iron-aluminium electro-chemical reactions. This is certainly worthy of further investigation since even a short increase in average life will result in substantial saving.

BEFORE THE FLASH

Electrical engineering literature has given extensive attention to lightning, and with good reason. Not only is the thunderstorm the most impressive natural manifestation of the power of electricity: it is also a vital factor in the design of electrical lines and supply apparatus. Yet the electrical engineer seldom starts at the beginning of the story. His interest begins when conditions are established in which a discharge can occur: from then on every detail interests him—currents and voltages; repetition rates; stroke characteristics. All these have some practical effect, whether it be on power system operation or on the method of installing lightning conductors. For the meteorologist, however, the discharge is the end of the story, and for years now he has been searching for the genesis of the phenomena; for a quantitative explanation of the mechanism of the cloud generator. Recently the ability of radar to detect the onset of rainfall, even within a cloud, has given the investigator in this field what may prove to be a decisive weapon, and in an article on a later page Mr J. B. Mason, a distinguished worker in this field of science, is able to present a picture more detailed in many ways than would have been available even a few years ago. The problem is an intriguing one, with the suggestion that the ultimate clue may be found in the electrical effects that accompany freezing of water—surely a topical turn to an eternal story.

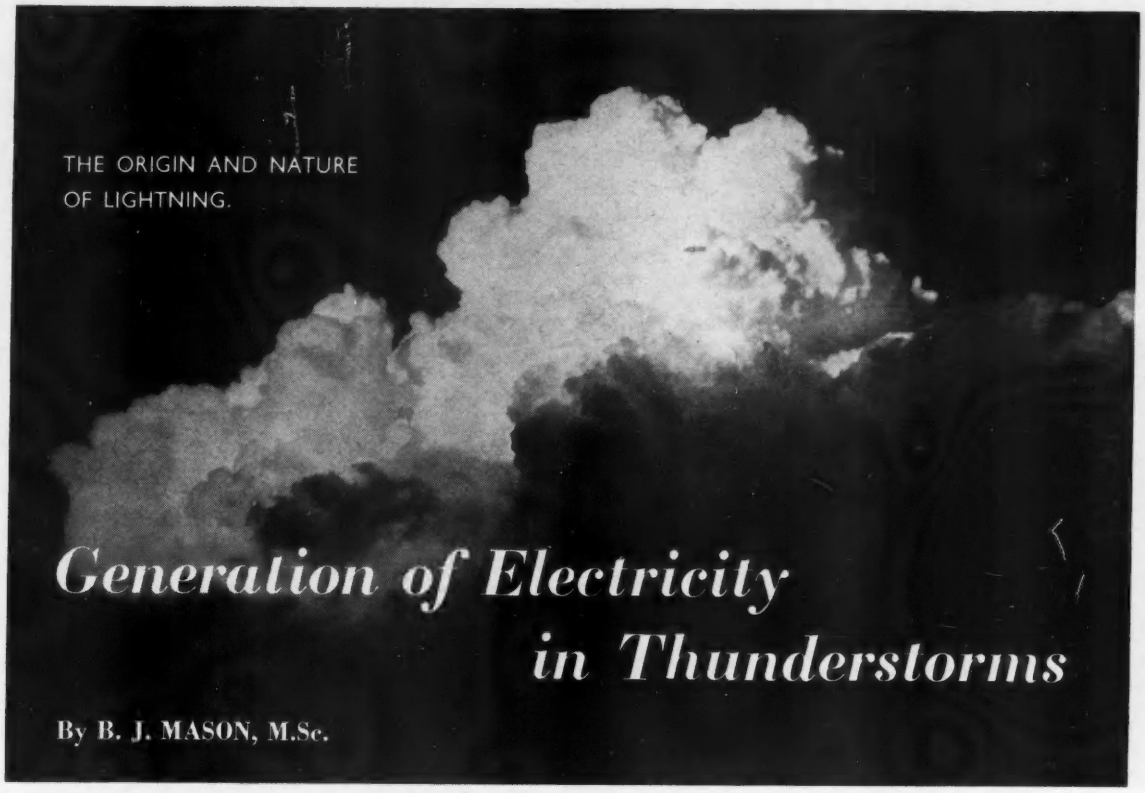
APPLIANCE SALES IN U.S.

The one outstanding feature of the electrical retail trade in the U.S. during 1953 has been the trebling of the sales of room air conditioners. The annual statistical review of *Electrical Merchandising* shows the numbers sold last year exceeded one million and with a wide range of models now to choose from a further major increase is to be expected in 1954. This is an ideal type of appliance to appeal to the public with its automatic features and all the attraction of novelty. In contrast such ultilitarian appliances such as water heaters are considered to lack the glamour so necessary to whet the prospective purchaser's appetite. None the less, electric space heaters were one of the few principal domestic appliances to set up a new record sales figure for the last five years, which gives the lie to those who point out that electric heating has no place in America. It is significant, however, that of the heaters sold 70% were of the type incorporating a fan to boost convection. Washing machines showed a substantial improvement last year and so did electric blankets and home freezers. There was a substantial increase in cooker sales over the previous year but the figure remains below the peak of a few years ago. On the other hand, the smaller cooking appliances, fat fryers, broilers and roasters have made spectacular advances which seems to indicate a changing way of life. The average picture for all appliance sales shows a slight gain over the previous year while the forecast made for 1954 is a recession but fortunately only a slight one.

INSTALLATIONS ON WHEELS

A pleasant suggestion of summers to come is given by the latest offering of completed work by the I.E.E. Wiring Rules Committee. Electrical installations in caravans provides the subject for this latest addition to the Committee's publications, and apart from the intrinsic technical interest of the recommendations made, the form in which they are presented is worthy of some attention. The new Memorandum on Recommended Practice, to give it its official description, is no substitute for the full Rules; rather, it sets out to indicate the degree of emphasis to be given to particular aspects of those Rules when caravans that may be plugged-in to the public supply are being considered. What results is a most useful document that seems to serve admirably the dual functions of code of practice and self-contained "simplified" wiring regulations. It deals with the desirability of an earth leakage trip, and the method of its connection and installation in the manner of a Code of Practice; on the other hand, when it comes to matters such as cable core colours and the bushing of outlets in cable runs, it is a summary of the full Rules—complete with references. No doubt the problem of the caravan provided a particularly suitable opportunity for the preparation of such a "memorandum," but if the publication proves in fact to be as useful as it appears to a non-caravanner, then the technique is worthy of extension, and might with advantage be followed in other near-specialised applications of the public supply.

Meteor



Generation of Electricity in Thunderstorms

By B. J. MASON, M.Sc.

ALTHOUGH the electrical engineer may be concerned more with the damage caused by lightning rather than with the physics of thunderstorms, he must often wonder about the origin and generation of lightning. On further enquiry he will find no shortage of theories, but it is unlikely that he will receive convincing explanations. This is because, after two hundred years of research, physicists and meteorologists are still trying to discover the exact nature of the processes which give rise to a lightning flash.

In essence, we can regard the thundercloud as an electrostatic generator which produces electrical charges, both positive and negative, separation of which leads to a concentration of positive charge in one region of the cloud and of negative charge in another region. As charge separation proceeds, the electric field between these charge regions, or between one of them and earth, grows until electrical breakdown of the air occurs. A conducting channel is then produced along which at least a part of the originally separated charge disappears during the passage of the lightning flash. Further separation of charge now takes place, and the chain of events is repeated.

In principle then, the operation of this "natural dynamo" is straightforward, but the detailed mechanisms of charge generation, separation and dissipation are not yet fully understood. However, considerable progress has been made in recent years, both in our knowledge of the meteorological and electrical structure of a thundercloud and of the structure and mechanism of the lightning discharge.

Meteorological Structure of a Thunderstorm

Exploration with the aid of aircraft and radar, mainly carried out since the last war, reveals that a thunderstorm consists of one or more localised regions, or cells, which contain strong vertical air currents and are the centres of raindrop and hailstone formation and of lightning activity. Each cell has a fairly well-defined life history—a growth stage, a mature stage and a decaying stage. While the whole life of a cell may occupy about an hour, the mature stage, during which precipitation is released and the lightning occurs, lasts for about 15 to 20 minutes. Very large, persistent thunderstorms probably result from successive cells developing in turn and passing through the three stages described above.

A mature cell (or that part of it in which precipitation particles are found) may have horizontal dimensions of 1 to 5 miles and extend vertically from the cloud base to a level at which the temperature is −40°C, a depth of typically 20,000 ft, but the top of the visual cloud may be much higher. There is evidence to suggest that in some cases a large cell is sub-divided into smaller units or sub-cells, with horizontal dimensions perhaps one-tenth of those of the cell. The vertical air currents may exceed speeds of 30 metres/sec (60 m.p.h.) although values of 5 to 10 metres/sec are more common.

The bases of most thunderstorms are warmer than 0°C, so that in the early stages of development, water drops will predominate in the lower regions where the temperature is above, say, −15°C, while a mixture of ice crystals and supercooled droplets will appear at colder levels up to the −40°C level, above which only ice crystals exist. The growth of raindrops by collisions between water drops of different sizes and fall-speeds commences in the lower part of the cloud, while the capture of supercooled droplets by ice crystals initiates the formation of ice pellets which may later develop into true hailstones, in the higher sub-freezing regions. These processes continue until the concentration and sizes of the precipitation particles become so large that they can no longer be supported by the upward air currents and then begin to fall towards the earth. The downward rush of heavy precipitation destroys

the upcurrent, a downcurrent now being initiated instead; this marks the onset of the mature stage of the storm with which we are mainly concerned. These features of the thundercloud are illustrated schematically in Fig. 1.

Electrical Structure of a Thundercloud

The distribution of charge inside a thundercloud was first deduced by C. T. R. Wilson by studying the manner in which the electric field changes produced at the ground by lightning flashes varied with distance from the storm. He concluded that there was an upper positively charged region and a negatively charged region lower down. The general validity of this picture has been amply confirmed by later work although individual clouds may be more complicated in detail than Wilson's simple bipolar model suggests. The most direct information comes from measurements of the magnitude and direction of the electric field as a function of height in cloud. The pioneer work was carried out by Sir George Simpson and his collaborators at Kew, using recording apparatus attached to a balloon. The records showed that the upper part of a thundercloud is positively charged and most of the lower part negatively charged. Also, in the majority of storms there was evidence of a localised region near the base of the cloud containing positive charge. The results could be represented schematically by a model with an upper charge of +24 coulombs distributed in a spherical volume of 2 km radius centred at a height of 6 km (temperature −30°C), a negative charge of −20 coulombs in a sphere of radius 1 km centred at 3 km (−8°C) and a charge of +4 coulombs in a sphere of radius 0·5 km centred at 1·5 km (+1·5° C). Thus the upper positive charge and the bulk of the negative charge were in regions where the temperature was below 0° C.

Some recent investigations by Malan and Schonland suggest that in the large, single-cell type of storm which is common in South Africa, the negative charge is contained in a nearly vertical column, which on occasion, may be 6 km long, the temperature at its base being about 0°C and its top frequently reaching up to, but not beyond the −40°C level. The work of the Cambridge School suggests that this type of storm is not so common in England where the charge and precipitation may be located in a number of small sub-cells, each of which may, in turn, become involved in a lightning flash.

It appears that the development of heavy precipitation is necessary for violent electrical activity in a thundercloud, the central lightning area usually being coincident with the area of highest precipitation intensity. The first lightning flash occurs about 10 to 20 minutes after the appearance of the initial radar echo which indicates the presence of precipitation. As the main charge centres appear above the 0°C level it is natural to associate its generation with the ice phase. Indeed, Kuettner from observations made inside thunderclouds on a mountain-top in Germany, reports that ice pellets (graupel) are the most frequent form of precipitation particle and are always accompanied by strong electric fields.

The Lightning Discharge

The electric field required to cause breakdown in dry air at normal atmospheric pressure is 30,000 V/cm; in a thundercloud, where the large raindrops become deformed into spindles under the influence of a strong field and produce corona (brush) discharges at their ends, the breakdown field may be less than 7,000 V/cm. Fields of this strength have not been measured, the highest recorded value being 3,400 V/cm. It seems likely, therefore, that fields strong enough to initiate breakdown occur only very

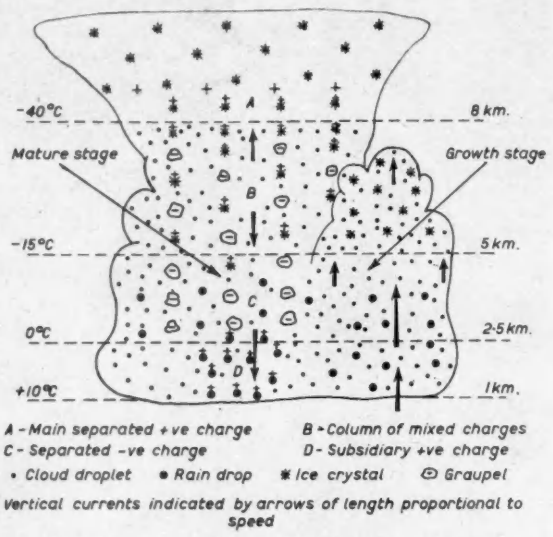


Fig 1. Structure of a thunder cloud shown diagrammatically

locally and may be missed by an aircraft or a balloon. The average field measured over a distance of say a kilometre, will probably not exceed a few hundred V/cm; but, even so, the potential difference between the positive and negative poles of the cloud will amount to some 100 million V.

A lightning flash may pass from cloud to ground or internally between the negative and positive poles within the cloud. The former are more easily seen and photographed and so have been studied more intensively.

There is some evidence that in clouds containing the pocket of positive charge near the base, cloud-to-ground discharges are often triggered by the intense electric field which exists between this positive centre and the base of the main negative column. The complex structure of a single flash has been elaborated in recent years mainly by Schonland and his collaborators in South Africa, using a special moving camera based on an original design by Sir Charles Boys. The technique allows not only study of the fine structure of the discharge, but also the speed and direction of propagation of the strokes to be determined. One form of the camera has two lenses arranged to rotate at opposite ends of a diameter of a circle. Images of the lightning discharge are recorded on a stationary film behind the lens. The distortion of the image resulting from the relative movement between the lens and film allows a distinction to be made between any portion of the discharge which becomes luminous before another portion. Photographs taken with such a camera reveal that the lightning flash consists of a number of successive strokes which follow the same track in space and occur at intervals of the order of 0·01 second; the average number of separate strokes is three, but as many as 47 have been recorded. A typical record is shown in Fig. 2.

A cloud-to-ground discharge is initiated by a streamer which develops downwards from the bottom of the negatively charged column in the cloud in a series of steps separated by time intervals varying between 15 and 100 microseconds. Each step is revealed in the photograph by a sudden increased luminosity of the freshly ionised air at the tip of the streamer. This stepped leader-stroke approaches the ground with a speed of about 10^7 cm/second, often along a zig-zag path with downward pointing forks or branches; hence the term "forked lightning." When this leader-stroke reaches the ground the main or

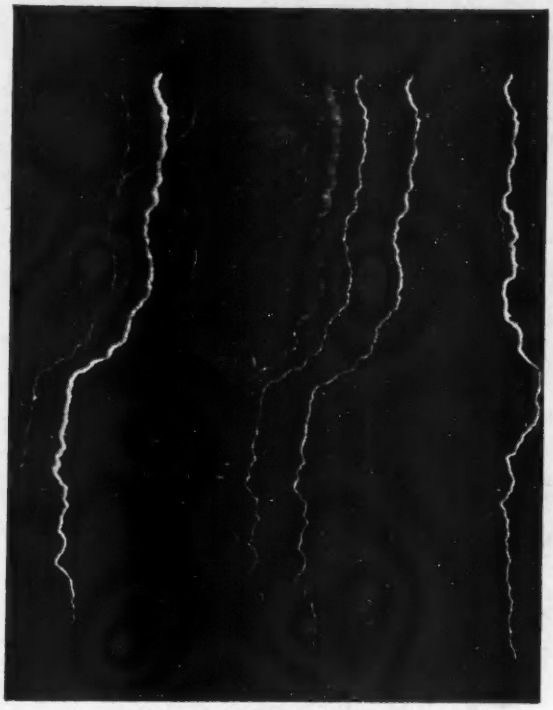


Fig 2 (above). A typical record of the stages of a lightning stroke, as obtained with a Boys' camera

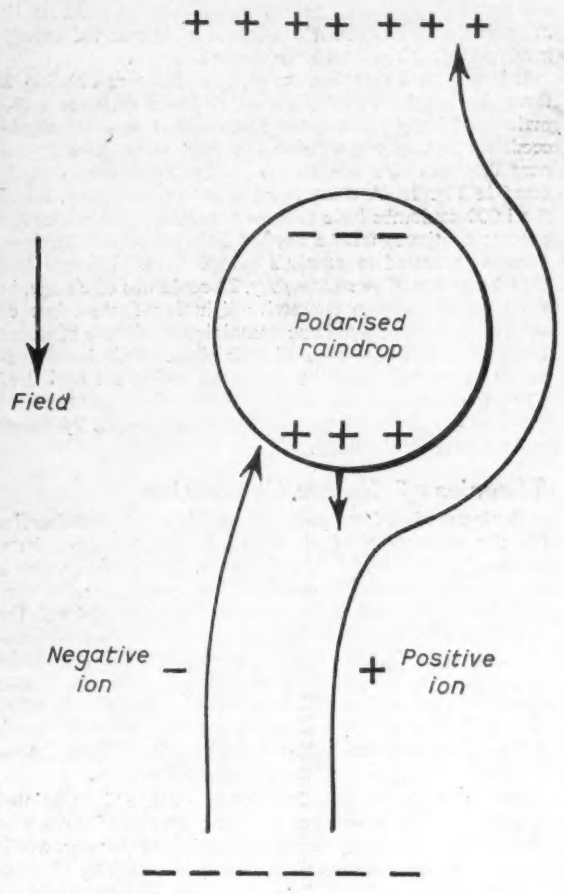


Fig 3 (right). Polarisation of a rain drop by the atmospheric electric field as envisaged in C. T. R. Wilson's influence theory

return stroke starts to travel up the pre-ionised channel which has been established between the cloud and the ground by the passage of the leader-stroke. The luminosity of this return stroke is much greater than that of the leader, its speed of propagation generally exceeds 10^7 cm/second, and it is during this stroke that the large currents (of order 20,000 amp) are observed. After the passage of the stepped leader-stroke there may be an interval of several hundredths of a second followed by a second leader and return stroke. The leaders to the second and subsequent strokes generally consist of streamers which develop in a single flight from cloud to ground and are called dart leader-strokes. Following the dart leader there is a return stroke which develops from ground to cloud. The average time interval between strokes is about 0·07 second, the average duration of the complete discharge being about 0·25 second.

A large proportion of lightning discharges occur within the cloud itself, and some may progress towards the earth without reaching it. Internal flashes are most common in thunderstorms with high bases, when it is easier for the discharge to pass from the lower negative to the upper positive pole of the cloud than from cloud base to ground. An internal flash is initiated by a stepped leader-stroke just as for a cloud-to-ground discharge, but there is no return stroke. The luminous structure of a cloud flash is often obscured by the intervening cloud droplets, so that only a general diffuse illumination (sheet lightning) is seen. About three-quarters of the energy in a flash is spent in heating up the narrow channel of air which it follows, the temperature rising in a few ten-millionths of a second to about 15,000°C. The air in the channel expands explosively to create intense sound waves which are heard as thunder.

Charges Involved in a Lightning Flash

By measuring the change in the vertical component of the electrical field at the ground produced by a distant lightning flash, one can calculate the electric moment destroyed, $M=2QH$ where Q is the charge neutralised and H is the vertical distance between the main positive and negative charge centres for an internal flash, or the height of the relevant charge above ground for a cloud-to-ground discharge. Measurements made in many different parts of the world suggest that the average charge dissipated in a lightning flash is of the order 20 to 30 coulombs. In an active thunderstorm flashes occur, on average, at intervals of about 20 to 30 seconds, so that the average current dissipated by lightning is about one ampere.

The rate of recovery of the electric field immediately after the passage of a lightning flash suggests that in the absence of leakage effects, the electric moment would be regenerated in about 7 seconds. The rebuilding of this electric moment implies not only a generation of the charge (Q) but a vertical separation (H) of the charges of opposite sign. It is generally believed that charge of one sign is attached to the large precipitation particles (raindrops, snowflakes or ice pellets) and that of opposite sign is carried upwards on the very small cloud droplets; thus the rate of vertical separation of charge cannot exceed the rate of fall v of the precipitation elements in still air. The magnitude and rate of recovery of the electric moment implies that the magnitude of the charges which are separating immediately after the discharge is about 8,000/v coulombs, where v is the fall-speed of the precipitation

elements in metres/sec. In the case of raindrops, the maximum value of v is about 8 metres/sec, so that the charge involved would be about 1,000 coulombs.

It is suggested that charges of both signs are distributed through a considerable volume of the cloud which is in the main electrically neutral, but that gradual separation proceeds throughout the volume to produce a positive region near the top and a negative region near the base as indicated in Fig. 1. A discharge may occur when say, 20 of the 1,000 coulombs have become separated, after which the process continues until a further 20 coulombs or so have become separated to supply a second flash. The problem then is not one of *generating* say, 20 coulombs of charge, in the interval between successive lightning flashes, but of separating it from a volume containing a mixture of about 1,000 coulombs of charge of both signs. This 1,000 coulombs of charge has to be generated during the period of 10 to 15 minutes which elapses between the appearance of precipitation in the cloud (which can be detected by radar) and the onset of lightning.

Theories of Charge Generation

During the last forty years at least eight different theories for the generation of electricity in thunderclouds have achieved prominence in the literature. Most of these have not been formulated in mathematical terms, so that they can be readily examined for *quantitative* agreement with the experimental data. A satisfactory theory must show quantitatively how charge can be created and separated at the required rate, and must be consistant with the known meteorological and electrical features of thunderstorms as described above. Space does not permit a detailed examination of all the theories* so that discussion will be limited to those which have gained greatest acceptance.

(a) *Wilson's Influence Theory.*—C. T. R. Wilson pointed out that a raindrop subjected to an electric field such as always exists in the atmosphere, even in fine weather, would become electrically polarised. In a downwardly directed field the lower half of the drop would become positively charged and the upper half negatively charged as in Fig. 3. In falling through a cloud containing both positive and negative ions (these are continuously produced in the atmosphere by cosmic rays, radioactive matter, etc.) the positive ions are repelled from the lower half of the drop and deviated to one side, while the negative ions are attracted to it. Hence the drop acquires a net negative charge, which being carried towards the base of the cloud, augments the pre-existing field. Such a mechanism would produce a charged cloud of the observed polarity but calculations show that it could generate only about one-hundredth of the required charge during the life-time of a thunderstorm cell.

(b) *Simpson's Drop-Breaking Theory.*—It has been established in the laboratory that the rupture of water drops in a strong vertical air jet produces considerable electrification. The large fragments of the broken drops acquire positive charges, the compensating negative charge being communicated to the air. The magnitude of the charges liberated depends on the violence with which the drops are shattered, but under conditions which are likely to be met in a turbulent thundercloud, amount to about 10^{-11} coulomb for each cubic centimetre of water disrupted.

Now raindrops growing in a thundercloud may attain a diameter of 5 mm above which they become unstable and break up. Simpson suggested that the attendant electrification might be a significant factor in the generation of thunderstorm electricity. It is clear, however, that if the large fragments acquire a positive charge and the negative charge is communicated to the air and to the small cloud droplets, gravitational separation will tend to charge the cloud in the opposite sense to that which is observed. Moreover, calculations again show that the charge liberated by such a process could account for only about one-hundredth of that involved in lightning flashes.

(c) *Simpson's Theory of Charging by Collision of Ice Crystals.*—Several years later Simpson suggested that the main charge structure of the thunderstorm above the 0°C level could be accounted for by the production of frictional electricity during the collision of ice crystals, which were assumed to receive a negative charge, the compensating positive charge being carried upwards on cloud droplets. At the time he had no information on either the sign or the magnitude of the charge released during such a process. Direct evidence is still lacking, but we now have some laboratory evidence to show that when slow air currents flow past a frost deposit, small splinters are broken off the delicate crystals, and that the splinters are predominantly positively charged, leaving a negative charge on the deposit. Such a process might have some relevance in a cloud where it is possible that splinters may be torn off the fragile snow crystals as a result of the frictional drag with the air.

However, the rates of charging found in the laboratory are very small and calculations based on these values suggest that, in a cloud, this mechanism could produce again only about one-hundredth of the required charge in the time available. Furthermore, it is doubtful whether snowflakes form a major part of the frozen water content of growing thunderclouds, where, as we have seen, compact ice pellets appear to be predominant.

(d) *The Workman-Reynolds Theory.*—This theory, put forward in 1948, is based on some experiments in which it was discovered that during the freezing of dilute aqueous solutions, a potential difference was developed across the ice-liquid boundary, the sign and magnitude of which depended on the nature and concentration of the dissolved substance. With the majority of solutions tested it was found that the ice became negative with respect to the liquid being frozen.

In transferring these results to a cloud, the vehicle is the wet hailstone, an ice pellet which, on reaching a critical size determined by the temperature and water content of the cloud, commences to capture small supercooled cloud droplets at a rate faster than these can freeze and so acquires a liquid coat. The assumption is that when this stage is reached, only a fraction of the water impinging on the hailstone becomes frozen and the rest is flung off in rather small drops. It is further assumed that during partial freezing of the cloud water which contains traces of various salts, negative ions will be preferentially incorporated into the ice as in many of the laboratory experiments and that the water flung off will carry away a positive charge, leaving the hailstone negatively charged. Gravitional separation of the negative hailstones and small positive drops will then lead to a charge distribution of the observed polarity.

There are several objections to the theory as presented by its authors, the chief of which is that the magnitude of the charges separated during freezing were very sensitive to the concentration of the solution. Moreover, the polarities of the ice and solution were reversed by the absorption of small quantities of carbon-dioxide and ammonia. When ice pellets were collected from clouds, were melted and refrozen, the electrical effects were either zero or of the wrong polarity. It seems unlikely that the production of thunderstorm electricity is dependent upon the cloud water containing just the right kind of soluble matter in just the right amounts.

**For a detailed quantitative examination of all the theories the reader is referred to a paper by the author in* Tellus, *Nov. 1953.*

A new theory has recently been proposed by the present author.† It is argued that the generation and separation of charge in a thundercloud is associated with the growth of ice pellets in the sub-freezing region of the cloud. That such pellets are a dominant feature of thunderstorms has been reported by Kuettner. Moreover when their growth is simulated in the laboratory by impinging supercooled water droplets on an ice surface, subsequent freezing of the droplets is accompanied by the appearance of a negative charge on the deposit, an equal positive charge being communicated to the air, probably by the ejection of small ice splinters. In these experiments it is very difficult to obtain consistent results because great care has to be taken to eliminate spurious effects, but two independent workers, one working with supercooled clouds produced in the laboratory and one with a natural cloud, have obtained the same value for the rate of charging, i.e. 5×10^{-12} coulomb per sq cm per second. The present author has used these results to calculate the charge liberated during the growth, in a thunderstorm cell, of ice particles by the accretion of supercooled droplets.

The theory involves computation of the growth of the ice particles in terms of the distribution of temperature, pressure, vertical air velocity and concentration of liquid water in the cloud, and an assumption concerning the number of ice particles per unit volume. The calculations show that if charge is liberated at the rate indicated by the laboratory experiments during the growth of these ice pellets, in a cell of radius 2 km and height 5 km with base temperature 10°C and containing a steady vertical air current of 10 metres/sec (20 m.p.h.), sufficient charge to satisfy all the requirements listed above and to supply 20 or more lightning flashes of average electric moment, would be generated within 11½ minutes of the appearance of the first ice particles. This is in excellent agreement with the fact that about 10 to 12 minutes elapses between the appearance of the initial radar echo (indicating the presence of precipitation elements) and the first lightning flash. It appears then, that this theory is consistent with modern ideas on the electrical and meteorological structure of the thunderstorm and with current theories of precipitation processes. Much remains to be done, however, before the origin of the charge involved in lightning flashes can be stated with certainty. More careful experiments on the electrification accompanying freezing are required while observation on the nature of, and the charge carried by, precipitation particles in active thunderstorm are almost non-existent. Final solution of the problem is likely to come only from close co-ordination between exploratory studies of the clouds, laboratory investigations of charging mechanisms and theoretical calculations of the type described in this article.

†*Mason, B. J., Quart. J. Roy. Met. Soc., Vol* 79, *pp.* 501-10, 1953.

Drying Out Transformers

Circulating and Absorption System reduces Time

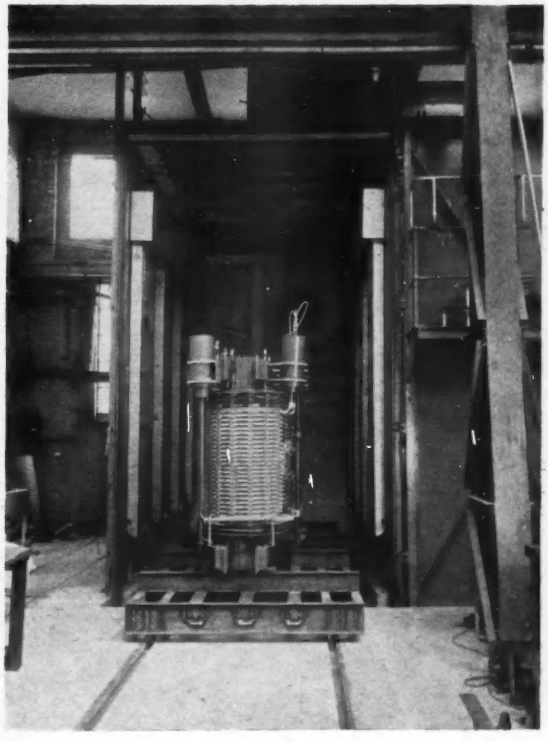
AN interesting installation for the drying out of large transformers has just been completed by Stordy Engineering Ltd., at the Brush Electrical Co.'s Works at Loughborough. It consists basically of an indirectly-heated, air-circulating drying oven, including a circulating system, whereby the air is passed through drying towers containing beds of activated alumina as a desiccant. This desiccant removes moisture from the air and lowers its humidity so that moisture is readily taken up from the transformer windings. It has been found that it is possible to dry out in thirty-six hours a transformer which by conventional means would require two weeks.

The dimensions of the oven are 18 ft deep by 15 ft high by 8 ft wide, and the transformers are loaded into the drying chamber on a bogie running on tracks laid in the floor. Precautions have been taken in the construction of the oven to eliminate air leaks and to ensure that the whole system is airtight.

The circulating fan is of the multivane centrifugal type, driven by a squirrel cage motor. After leaving the fan, the air passes through a system of distributive ducting to ensure even drying. Before returning to the fan the air passes through a heat exchanger heated by town's gas.

Initially the air drying towers are not used, atmospheric air being let into the system and the moisture and fume laden air being vented. When the first stage has been completed, the fresh air connections are sealed and the closed circuit air passes through the drying towers. Two towers are used so that one can be reactivated while the other is taking up moisture. A duplex fan unit is used simultaneously for both towers; in one hot air is drawn over the beds to reactivate them, and in the other circulating air is drawn up. Each drying tower is capable of operating effectively for four hours, when an automatic process timer effects the necessary transfer.

The reduction in the time cycle has indirect advantages, in that the rapid removal of moisture eliminates rust on core, and reduces shrinkage of "elephantide" and other types of spacer.



The distribution ducts are clearly seen in this view of the oven

Cables and Caravans

NEW PUBLICATIONS FROM I.E.E. WIRING REGULATIONS COMMITTEE

A SUPPLEMENT to the 12th edition of the I.E.E. Wiring Regulations, taking account of the revised B.S. 7 "Rubber insulated cables and flexible cords for electric power and lighting," and B.S. 2004 "P.V.C. insulated cables" was issued last week by the Wiring Regulations Committee of the I.E.E. At the same time, a Code of Recommended Practice for Electrical Installations in Caravans has been published.

Regulations affected by the new supplement are 307, 309-311, 315, 404, 405, 1306, 1308, 1309 and 1311, and certain tables are provided with alternatives where B.S. 7 (1953) or B.S. 2004 cables are used. The general effect is that cables conforming to the new standards are acceptable for the purpose of the Regulations with the following three exceptions:

(*a*) The use of parallel twin rubber or p.v.c.-insulated flexible cords is not recognised (New Clause Reg. 1308 B).

(*b*) Tough rubber-sheathed flexible cables with reduced thickness of rubber insulation designed for special purposes may be used only with vacuum cleaners. Twisted twin flexible cords with thickness of rubber or p.v.c. insulation further reduced may be used only for pendant lighting fittings (Reg. 307 B and C and 1308 C).

(*c*) The use of twisted twin p.v.c.-insulated flexible cord without colour identification of cores is not permissible (Reg. 309).

Provision is made that in a three-core flexible cable other than a flexible cord, the earth-continuity conductor may be coloured white, but in this case it must be further identified by a green sleeve at each end. (Amended Reg. 309). Blue may be used instead of black for the negative or middle wire in such a flexible cable in a d.c. system (New exemption to 310 A and B) and for the earthed neutral in an a.c. system (Exemption to 311 A).

Cable Installation

Other changes in the Regulations include the specific statement under "Selection of Runs," that no special precautions are required when p.v.c. cables to B.S. 2004 (1953) are used: but a footnote draws attention to the need to keep p.v.c. cables to B.S. 7 (1946 revised) from conditions where deformation may occur if the temperature exceeds 135° F (revised Reg. 315 G). B.S. 1327 "Insulated asbestos roved flexible cords" is now exclusively invoked for compliance with Regs. 315 H and 1309.

Regulation 404 A, which requires the protection of t.r.s. cables from direct sunlight, is now restricted to B.S. 7 (1946, revised) t.r.s. cables, and to others having a sheath of general-purpose compound based on natural rubber or heavy-duty natural rubber. It thus excludes from this precaution cables sheathed with polychloroprene compound. In the immediately following Regulation 405, conduits, the preamble which deals with types of cable which may be installed in conduits has been re-written to exclude H.S.O.S. type cable having hard-drawn conductors. A note has been added to the Regulation calling attention to the remarks made in Codes of Practice on aluminium and zinc alloy conduit and fittings.

Finally may be noted an alteration to Regulation 1306, by which B.S. 7 and B.S. 2004 cables are specifically recognised for the purposes of the regulations, but the use of a semi-embedded braid as a means of reinforcement is no longer mentioned.

Table 4 in the Regulations, which deals with dimensions and resistance of conductors is provided with an alternative giving resistance values based on 20° C (68° F) instead of 60° F (15·6° C). Table 16, flexible cables, other than flexible cords and Table 17 are similarly provided with alternatives based on the new temperatures.

Alternative Tables 22 and 23 are perhaps of rather more importance. They set out the maximum number of cables of the new types that may be drawn into conduit. The magnitude of the change may be indicated by a few spot examples. For 3/·029 250 V grade cables in ¾ in. conduit the number is now 6 (it was 5); for 1 in. conduit 13 (10). For 7/·029 250 V grade cables in ¾ in. conduit 4 (4); in 1¼ in. conduit 13 (10). For 660 V grade cables there is no change. The new and old tables gives the same permissible maximum number of cables.

Besides the supplement for the main regulations, a shorter edition has been drawn up to go with the Abridged Wiring Regulations. Both supplements may be obtained from the I.E.E., Savoy Place, London, W.C.2, price 6d., including postage.

Caravans

The Code of Recommended Practice for Electrical Installations in Caravans is the outcome of a conference called early in 1952 to discuss differences of view as to the extent which the Wiring Regulations apply to caravans using a mains electricity supply. The new recommendations apply to trailer caravans using a public or private supply at a voltage of about 250, and where the neutral conductor is permanently and effectively connected to earth. They do not depart from the full Wiring Regulations, but rather indicate the degree of emphasis to be given, in caravan installations, to particular aspects.

The recommendations are made on the assumption that protection by fuse against earth leakage is normally provided, and that in addition an earth-leakage circuit-breaker is installed. Owners of caravan sites should provide a terminating point for the supply undertaking, in which the service fuse and meter are installed. An earthing terminal should also be provided, connected to the supply system neutral in one of four possible ways.

Connection to the caravan should be made by t.r.s. or p.v.c. sheathed flexible cable containing an earth continuity conductor, terminating in an inlet plug at the caravan end—i.e. a plug having recessed contact tubes.

Directly following the inlet socket should be a d.p. earth-leakage circuit-breaker, and then the main fuse or circuit-breaker and the circuit fuses. There is the usual provision that throughout the installation, no fuse or non-linked switch shall be connected in the leakage conductor.

Recommendations are made for the wiring of sub-circuits, and alternative schemes are suggested for the lay-out of socket-outlets. Provision is made that the e.l.c.b. should be capable of actuation by a leakage current not exceeding 40 milliamps, and that the earthing lead should have a conductor not less than 7/·029. An earth spike at least 2 ft 6 in. long should be provided.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Lower Domestic Voltage

SURELY Mr Ison in your issue 28th January is at fault in stating that in the U.S.A. the maximum voltage between poles is 115 volts with an earthed centre tapping. According to the Standard Handbook for Electrical Engineers, edited by A. E. Knowlton, "secondary mains supplying general lighting and small power are usually single-phase 3-wire mains operating at 120 volts line to neutral, and 240 volts line to line. Incandescent lamps, heating devices, f.h.p. motors and other appliances rated 115 volts are supplied from the 120 volt line and neutral. Electric ranges, single-phase motors up to 5 h.p. and large appliances rated 220 or 230 volts are supplied 240 volts."

From the above it would appear that 120 volts to earth is the general rule, and in the bathroom where a fair proportion of electrical accidents take place, 120 volts to earth can be as lethal as 240.

The introduction of lower voltage distribution on a national scale would, I suspect, introduce economic and technical problems of an insurmountable nature.

"Contractor,"

ISLINGTON, LONDON.

Status of the Engineer

MR PALMER'S controversial article regarding the status and salary of the professional engineer, in your issue of the 28th January, seems to indicate that his Electrical Power Engineers' Association is the only body that can achieve this.

The E.P.E.A. has a membership comprising professional engineers, which can be taken as those who are chartered electrical or mechanical engineers, and also a large proportion of engineers not so qualified. Now a trade union must please the masses, which the E.P.E.A. does try to do. The professional engineer, who forms a minority in this association is thus rather forgotten, particularly "the engineer/administrator" for whom the remuneration is so compressed in the higher grades that the increased pay is not an incentive for taking extra responsibility with promotion.

Surely, Mr Palmer, an association, which does not have to cater for two groups, can better achieve, though maybe after some time, what the E.P.E.A. has so far left neglected. I am sure that the Engineers' Guild will do this, since it is an association for Chartered Civil, Mechanical and Electrical Engineers.

L. Ananin, B.SC.(ENG.)

HAYLING, HAMPSHIRE.

* * *

ALL engineers in the electricity supply industry must find great satisfaction in the views expressed about their importance in the letter from Mr Palmer.

This industry of ours, so paramount in its importance to national life, must not fall into the dead hands of the non-technical administrator. To pursue its course as a most virile undertaking, it must be guided by Technical Managers with the vision to recognise the technical trends of the future, and the courage to speculate in long-term development. It was so in the past, has been proved by history to be correct, and nothing must be permitted to hinder it in the future.

I am appreciably surprised to find so many of our technical men allying their interests with the non-technical. By that I mean the Association of Managerial Electrical Executive. At one time, the organisation from which it sprang, The Association of Municipal Electrical Engineers, was jealously reserved for those in top technical management. Nowadays, we find it diluted with others, for what appears to me to be the need to increase its membership by any means to claim that it has some reasonable staff representation. The Association has perforce to change its name, but in maintaining its initials it appears to have retained a peculiarly unfounded appeal for some of our technical men.

Whilst I am now critical of my colleagues, I do appreciate, however, the feeling of uncertainty in which we were all placed in the early days of Nationalisation. I was quite undecided whether to retain my E.P.E.A. membership or to join the new group, A.M.E.E. Fortunately, through all the furore of reorganisation I decided to wait a while and watch developments. I am very glad indeed that I did, for it is now obvious to me that from a critical examination of reasonably settled circumstances, in the regard which the E.P.E.A. has for the technically trained manager lies our hopes for the future.

I am, therefore, concerned at the division of our forces and the damage which can be done to our interests with a section of my colleagues allied to an Association with non-technical interests. The solution is very obvious to me, and I think that, on careful reflection, there must be a desire for complete unity of approach through the one and only Technical Association in the electricity supply industry, E.P.E.A.

"District Manager."

The User's Viewpoint

EVERY week in this modern age of electricity we find from the advertisements in your journal that manufacturers of electrical appliances are retailing new designs of component. Perhaps simply a new design of plug, socket and plug-top for example; what could one think of more simple?

For a moment, however, let us recall the countless number of makes of plug-tops, and what is more important, the length of time it takes to connect up the various makes; anywhere between a few minutes to quarter or half an hour.

Without any thought whatsoever, a contracting electrician could reel off his tongue twenty faults with various types of every day appliances from plug-tops to large fuse-boards, tube fittings, and so on, from the installation point of view. Surely on the staff of these large manufacturing firms there is a competent electrician who, with this point of view in mind, could advise the manufacturers before the component reached the assembly lines.

Eric Buckley,

HALIFAX, YORKS.

Corrosion of S.C.A. Lines

I.E.E. PAPER GIVES SERVICE EXPERIENCE OVER PAST 20 YEARS

IN the years 1928-33 some 20,000 miles of steel-cored-aluminium conductors were erected. It was at the time appreciated that difficulties might arise from corrosion, particularly in industrial and coastal areas, and arrangements were made early in 1933 to initiate a programme of tests on samples taken from selected localities. The first series of tests was made in 1934, and others followed at two-yearly intervals up to the outbreak of war. Post-war studies have also been carried out on an extended scale, and in addition methods of preventing or reducing corrosion have been investigated, both in the laboratory and in the field.

The results and conclusions consequent on this work were given by DR J. S. FORREST and J. M. WARD in a paper presented last week to the Supply Section of the I.E.E. It began by dealing with methods of estimating corrosion. The first method, adopted for the 1934 tests was to take a sample of the conductor, place it in a testing machine (8 ft between the grips), subject it to a load of half the specified ultimate strength for five minutes, and the load was then increased until failure occurred. This system was not found to be very satisfactory, for the composite s.c.a. conductor was difficult to grip, and it was not easy to be certain that the ultimate strength of the conductor under working conditions had been reached. In 1936, it was decided to make measurements on the individual aluminium and steel strands from the conductors and this method had been used up to the present day. The ultimate strength and elongation on breaking of a 10 in. length was measured with a small testing machine, and the stress/strain curve of the strand recorded for permanent reference. In a typical conductor, with 30 aluminium strands in two layers and a core of seven steel strands, three would be taken from the outer layer, and the same number from both the inner layer and the core.

Recently it had been considered that a more realistic measure of the deterioration of the whole conductor could be obtained by computing the strength of the conductor from the measurements on the individual aluminium and steel strands. The strength of the whole conductor was taken to be 98% of the sum of the measured strengths of the aluminium strands plus 85% of the sum of the measured strengths of the steel strands (B.S.215:1934). If, however, the measured strength of the steel strands exceeded the specified value for a new conductor—a common occurrence—the specified value was used in the computation, the percentage deterioration was then the percentage difference between the value computed on this basis and the specified strength of the complete conductor.

The degree of corrosion which set a limit to the life of the conductor was not always easy to fix definitely but a limit of 12% loss in strength of the whole conductor appeared to be a satisfactory figure in practice. Electrical conductivity methods had been tried but it was generally found that mechanical tests gave the best criteria.

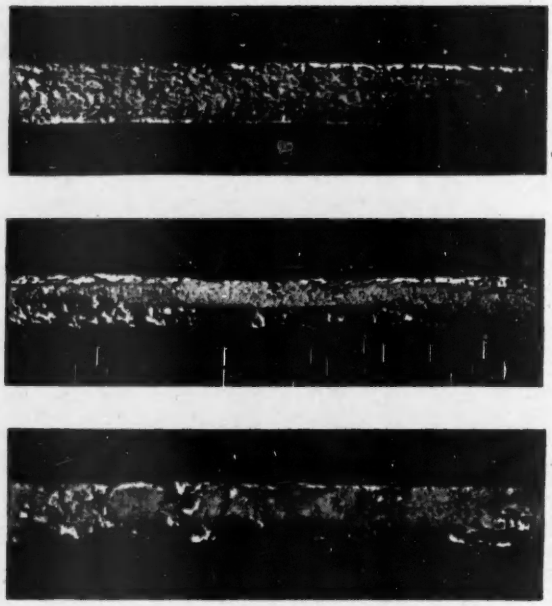


Fig 1. Examples of corrosion from 37/·11 conductor (Agecroft Chadderton), top outer aluminium, outer surface ; middle, outer aluminium inner surface ; and bottom, inner aluminium

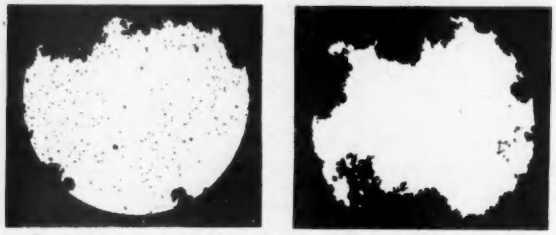


Fig 2. Cross-section of strands in Fig. 1, left outer strand, right inner strand

Results

In 1934, 35 samples of 132 kV line and earth conductors were tested. No definite signs of a decrease in ultimate tensile strength of the conductors was then found, but a slight tendency was noted for the electrical resistance of the outer aluminium strands to increase with age. Signs of pitting were also apparent in conductors which had been energised, but these were not present to the same degree in comparable conductors which had been exposed, but not energised, for the same period. By 1936 deterioration was becoming apparent, and in some cases the tensile strength of outer aluminium strands had fallen by 10% with a resistance increase of 5%. Further tests in 1938 indicated that corrosion had taken more toll, and that the average rate of increase in resistance of the outer aluminium conductor was about 1% per year. During the war years, numerous samples were examined which in general confirmed previous findings, although exceptional cases of abnormally heavy corrosion occurred. The corrosion

could be divided into two broad types, external and internal, the former associated with industrial areas and the latter with coastal districts.

Between 1949 and 1952 samples were obtained from the fourteen divisions of the B.E.A. with the intention of obtaining an overall estimate of the rate of deterioration throughout the country. In all 244 samples of line conductor and earth wire from industrial coastal and rural districts were tested for tensile strength and elongation; resistance tests were made on a fair proportion, and measurements of weight loss and reduction in cross sectional area were made on a few selected samples. In the analysis of results, only those for 37/·11 in. and 37/·102 in. line conductors and 19/·11 in. and 19/·102 in. earth wires, with no form of protection other than the standard bitumen coating on the core of the earth wires, were chosen. This selection reduced the number of results analysed to 177, made up of 130 line conductors and 47 earth wires.

As a first step the results for total deterioration were plotted against time in service, and it was found that the rate of deterioration for most of the line conductors lay between 0·1 and 1·0% per year, and for most of the earth wires between 0·1 and 0·5% per year. The results were then analysed statistically after the line conductors had been divided into two classes, coastal and industrial. This analysis indicated that with a maximum permissible deterioration of 12%, the mean service life in industrial areas was about 24 years and in coastal areas about 30 years. For earth wires, the mean expected life was about 35 years.

Fig. 3. Typical coastal corrosion bulge on 37/·11 conductor (Hayle-Fraddon)

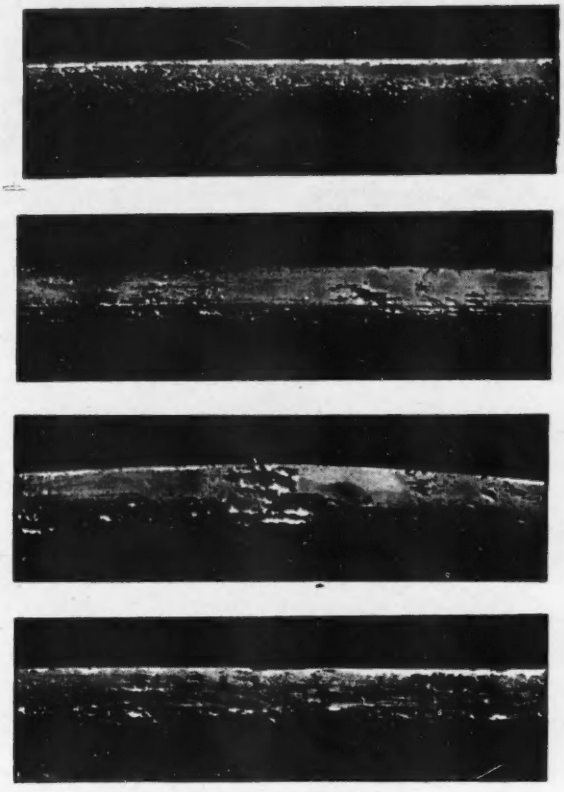


Fig. 4. (Hayle-Fraddon) From top to bottom—Outer aluminium, outer surface: outer aluminium, inner surface: inner aluminium, outer surface: inner aluminium, inner surface. (Coastal corrosion)

Types of Corrosion

In industrial areas the main corrosion attack took place on the exposed outer surface of the outer layer. The inner side of the outer layer, and the outer side of the inner layer showed signs of pitting which was, however, most severe on the inner strands. The steel core, although stripped in parts of its galvanising showed little attack.

Coastal corrosion on the other hand took the form of bulges or swellings caused by corrosion products between the steel core and the aluminium strands. Here the attack was mainly internal, the outer surfaces only showing slight attack. This is shown in Figs. 3 and 4.

The industrial agents leading to corrosion, were the combined effects of sulphur oxides, moisture, and the soluble and insoluble fractions of the solid pollution from industrial chimneys. Carbon could assist corrosion by adsorbing sulphur oxides and concentrating them at the surface of the metal. It could also act as an oxygen electrode and in the presence of polluted moisture as an electrolyte, a corrosion cell could be formed with the carbon as cathode and the aluminium as anode.

In coastal districts when salt spray penetrated the conductor, the high concentration of chloride ions caused breakdown of the protective film. Electrochemical effects of the contact between the aluminium and the steel core then accelerated internal corrosion. Initially the zinc in the galvanising was attacked, the aluminium (cathodic to zinc) being protected. When the galvanising had been removed the aluminium became the anode, and the steel the cathode with the result that the steel was protected at the expense of the aluminium.

Probably one of the main reasons why aluminium conductors appeared to suffer more from corrosion than other exposed aluminium structures was due to the attraction of solid particles on to the cable by the electrostatic field.

Attention was also paid in the investigation to the purity of the aluminium used, and it was found that no evident relationship existed between the purity of the aluminium, or the percentage of any particular impurity, and the rate of deterioration of the strands as measured by the annual loss in tensile strength.

A homogeneous conductor of aluminium alloy of suitable strength and resistivity would not be expected to suffer from bulging due to galvanic effects. Only one alloy has been used for this purpose—Silmalec—and the results from laboratory tests in a corrosion cabinet and exposure tests of single strands indicated that the resistance of Silmalec was probably less than that of aluminium. Field trials had been planned in co-operation with conductor manufacturers to compare the behaviour of Silmalec and s.c.a. conductors on adjacent lines in an industrial district. There seemed no doubt, however, that to prevent interlayer and external corrosion of Silmalec conductors in heavily polluted districts some form of additional protection would be necessary in the same way as was required for s.c.a. conductors.

The most effective method of preventing corrosion was, in the author's view, by the use of protective material such as grease, bitumen, paint or plastic film. Of these, some heavy greases had proved the most effective and trials had carried out on some lines, although these trials had been necesarily of short duration (between 5 and 8 years). There was thus little information available from which to estimate the increase in conductor life. Approach lines, however, suggested that an increase of about 10 years could be expected, and on this basis (assuming an additional 5% on the cost for greasing and erection) the saving on capital costs on an annual basis would be 48% for a 10 year life; and for a 25 year life would be 25%.

For maximum protection in industrial areas, complete impregnation—including a thin layer of grease on the outside of the conductor was necessary, but this could be dispensed with in coastal districts provided sufficient grease was applied to the penultimate layer to squeeze through the interstices between the strands and seal the outer conductor. Bitumen was not an effective corrosion preventive as in time it cracked, hardened or disintegrated.

DISCUSSION

MR P. J. RYLE (Merz and McLellan) said it was satisfactory to know that in clean areas the life of conductors might be fifty years or so. This was of particular interest in connection with lines put up in the Colonies or in parts of the Commonwealth which were far from the coast and from industrial pollution. It was also satisfactory that the steel core was not the weak point, as was believed in the early days when the Grid specification was under consideration. With the worst type of corrosion, even when the zinc had gone, the steel core was still a very reliable mechanical part of the conductor. Earth conductors were shown to have a longer life than line conductors in spite of having, on the main Grid, only one as compared with two layers of aluminium. The reason was, of course, that being dead they did not collect the products of atmospheric pollution to the same extent. Really pure aluminium was one of the best materials for not exhibiting corrosion, and the aluminium in s.c.a. conductors had a purity of about 99·5%. This was not specified in B.S.215, for instance, but the specified conductivity ensured a purity of about that figure. It was interesting to speculate on whether a purity of 99·9% for bad areas, if it could be specified, would justify the probable extra cost of production.

DR U. R. EVANS (Cambridge University) said that the authors had produced an admirable piece of work in giving an objective account of tests lasting twenty years on the behaviour of aluminium in contact with steel. If analogous information were available about the behaviour of aluminium alloys used in structural engineering and in aircraft in contact with steel, a lot of headaches would be saved. Perhaps the most interesting outcome of the authors' laboratory tests was that when the zinc corroded a small amount of iron went into solution, changing the polarity. It was probable—and this was borne out by experiments elsewhere—that this iron was deposited on the aluminium not as metallic iron but as magnetite. If so, there was every chance of dangerous corrosion occurring. If this small amount of iron could be prevented from being re-deposited, one might get a better life. For this purpose, zinc spraying of the whole conductor might be considered, or if this was too expensive or if the aggregate was felt to be unsuitable, zinc-rich pastes might offer a solution. In conclusion, he suggested that the histogram was not the best method of using statistical data as it meant throwing much valuable material into the waste-paper basket.

MR E. W. SKERREY (British Aluminium Company), speaking on behalf of Dr F. A. Champion and himself, suggested that in analysing their results the authors should take into account the severity as well as the type of corrosion. This would give four classes instead of two (coastal versus the rest) which in descending order of severity of attack would be industrial-marine, marine, industrial and rural. Greases for use inside the conductor should have high adhesion and low cohesion to ensure the retention of the grease film on all metal surfaces, but the authors appeared to prefer low cohesion only for external greasing. They appeared to regard plastics as unsuitable, but had they considered a plastic skin to coat the conductor completely? Admittedly this might not be an economic proposition.

MR H. R. SCHOFIELD (B.E.A.) said that at present the practice was to use conductor with the full impregnation but no cover overall. In one case where the conductor was covered overall there was considerable trouble in erection. It collected foreign bodies and blocked up in the running-out blocks, and it was doubtful whether much grease was left in some places at the end. Again, grease was apt to drop off in hot weather and lead to complaints.

MR W. J. NICHOLLS (Aluminium Wire and Cable Co.) expressed some doubt as to whether the number of samples in the 1949/52 series was sufficient for the purpose of statistical analysis. More important, he said, was the question whether these samples were really representative of conductors all over the country. There was a tendency—a very human tendency—to take samples showing interesting corrosion.

MR R. C. BROWN (J. L. Eve Construction Co., Ltd.) said that it was his experience that greasing was unsatisfactory from a line erection viewpoint; Dr Evans' remarks about zinc spraying were very interesting, therefore.

M. HERENGUEL said that many tests had been made in France. One important factor was the quality of the zinc. Some conductor was found to contain chloride, inclusions arising, no doubt, during manufacture. These caused marked corrosion. Apart from this, the results were very satisfactory. Climate was undoubtedly important: Conductors on the Mediterranean were in an excellent state of preservation after fifteen years' exposure but the farther north one went the worse they became. Greasing, even when the grease was not very suitable, effectively protected aluminium strands.

MR A. M. EVANS (Shell Petroleum Co.) said that in general grease gave very good protection. There was an optimum film thickness which would resist flow or drainage. The great need was for a material that was fluid when heated and yet would not lose its properties. From some points of view grease might not be ideal but it had great advantages and its use would probably be extended in this country and overseas.

MR W. G. HAWLEY (B.I.C.C.) suggested as an alternative to greasing, putting an aluminium sheath over the whole of the conductor.

MR J. C. TUCKER (Aluminium Laboratories Ltd.) said that in view of the variety of atmospheres in this country wide differences must be expected in the behaviour of conductors.

MR B. DONKIN (Kennedy and Donkin) suggested that the real criterion of conductor deterioration was not the average condition over a length of cable but the condition at the worst point. Similarly, what mattered was the rate of deterioration on conductors which were deteriorating very rapidly and not mean values.

MR C. A. MORTON said that he could confirm that electrolytic corrosion was more marked in coastal regions, although it did occur from time to time in odd industrial situations owing to particular conditions at a particular place, for instance, the vicinity of chemical works. The best method of combating corrosion was suitable greasing.

MR J. C. BAILEY (Aluminium Development Association) said that while he was in favour of greasing the interior of conductor, he saw little advantage in coating the exterior, since it would only afford protection for some three or four years. He expressed the hope that the authors would continue their work so as to check their forecasts against actual experience.

MR P. ROBINSON (Kennedy and Donkin) suggested that the saving on greased conductor, though appreciable, would not be so great as the authors' estimated, taking into account interest and depreciation.

around the trade

by Peregrin

THERE was unaccustomed jubilation among electrical retailers after Christmas when a long overdue cold snap coincided with an unexpected reduction in purchase tax. The welcome result of this happy combination was that electric fires which had been hibernating since last spring were awakened to a sudden demand. Some traders quickly sold out and there was less grumbling than usual about having to bear the cost of the tax reduction. One of them probably spoke for many when he explained that a seasonable reduction in tax usually boosts sales, so while the profit per sale is smaller until the higher taxed stock has been cleared, the aggregate profit more than makes up for the loss caused by the tax reduction. Still, such commendable philosophy will not appease the multitude who view with intense disfavour the Government's policy with regard to changes in purchase tax.

Manufacturers were not quite so pleased as the retailers, though resigned to the inevitable result of a change in tax. During last year many of them produced excellent catalogues, showing list prices with the appropriate tax added. These became out of date overnight, but the makers quickly rose to the occasion. One well-known firm sent out a large card, dated 5th January, amending all prices accordingly, while several sent gummed slips to be attached to the now incorrect catalogues. It is to be hoped we shall never have to revert to that tiresome and brain-teasing exercise in which the retailer, and often the customer himself, had to refer to a set of tables at the end of the catalogue and work out the tax for himself, according to the rate of tax ruling at the moment. In a price list which included fires, water heaters, cookers and cleaners, it was a complicated process to cope with the various symbols denoting rates of tax or no tax at all.

New Trading Policy

The recently published Trading Policy of the Electrical Appliance Dealers' Association has not earned the unqualified approval of those it most concerns, the electrical retailers. It is considered that the "Retailer Definition" is too wide. It covers not only electrical and radio dealers but furnishers, ironmongers, chemists, tool merchants and department stores. Many of these can and do maintain and display a reasonable stock, and the provision of adequate repair facilities presents no great problem. Yet the poor electrical contractor who spends most of his life among electrical appliances, and a good deal of it in repairing those sold by other people, is to be denied the full trade discount unless he keeps a shop. I seem to feel a cold wind blowing from 14 Bedford Row.

The Policy does not take into account the growing closed agency tendency, in which a manufacturer chooses his retailers, forsaking all other, and awards only them the full discount. It is hardly likely that manufacturers will submit their proposed lists to the E.A.D.A., or to any other organisation, for approval, in which case the Policy is little more than well-intentioned wishful thinking. The Association would do well to publish the views of electrical manufacturers on the Policy, if such views are yet known. On one point the E.A.D.A. is rather behind the times. It deprecates "no deposit" terms for hire purchase. The Law also deprecates them, to the extent that it is still illegal to accept less than 33⅓% deposit for hire purchase of domestic electrical appliances.

Consignment Scheme

The "Consignment" or "Sale or Return" retailing scheme is now well launched, and it should prove a success, in spite of ignorant or at least uninformed murmuring about tax evasion. It is of course no such thing. After all, the Chancellor wants money and he does not much care how it is obtained so long as the result is the same. With the experience of last year in mind a retailer might well order no more stock and virtually cease selling until after the budget, in which case he would yield no tax at all. This temporary expedient does encourage him to make his normal sales efforts, without the fear of being left with depreciated stock, and the Exchequer is more likely to gain than lose under the system. Incidentally, the scheme is not new, as seems to be thought. It has been tried in purchase taxless days on a "pay-as-you-sell" basis, to encourage retailers to maintain a good stock, without having to tie up their capital in it.

Flexible Opinion

One of those trade topics which alternately rise to importance and sink to oblivion is now erupting among manufacturers and retailers. How much flex should an electrical appliance, especially a fire, be awarded? It is contended that many customers demand more than the usual ration of two yards, so the problem seems to be, for the manufacturers, whether to increase the standard length and waste the extra flex in cases where two yards would have sufficed, or make no change and endure the present admittedly wasteful practice. For there must be thousands of discarded two yard lengths in retailers' shops, not very hopefully waiting to be used up. It is fortunate that the customer does not usually insist on his rights. For the two yard length is of course included in the price of the appliance, so if the buyer asks for a four yard length he may reasonably point out that he has already paid for two yards, even though they have since become the unwanted property of the dealer.

One manufacturer is toying with the idea of sending out fires with no flex at all, as his answer to the argument, but that would help no-one except the manufacturer. A customer may want to see the fire demonstrated, and in any case he may wish to carry it home under his arm, for immediate use. It would be no fun for the harassed retailer, at a busy week-end, having to fiddle about with flex and nuts and bolts before an audience of waiting customers. One solution would be an external plug-in connector for fires, but it would have to be much more efficient and robust than many of the haphazard connecting devices already in use, on irons for instance. Besides, a well-designed connector would raise the cost of an appliance considerably, while the customer would find it raised still higher when he had to buy the missing length of flex.

HYDRO POWER in CANADA

Annual review shows 638,000 h.p. added in 1953

ALTHOUGH a tremendous amount of hydro-electric construction was being carried out in Canada during 1953, the capacity of the plant brought into operation was somewhat lower than that recorded previously in recent years. In all, 638,012 h.p. of plant was added, bringing the total of Canada's water-power up to 14·9 million h.p. The plant extensions and new projects scheduled for operation in 1954, however, total 1·5 million h.p., and for later years it is hoped to install about the same amount.

Total power consumption in the year was about 7% above that for 1952, and although all demands were generally met, at times there was little reserve capacity available. Some relief from the effect of peak loads was, however, obtained by the completion of important interconnections between independent generating systems.

British Columbia

In British Columbia, the Power Commission completed the installation of the final two 28,000 h.p. units in the John Hart development on Campbell River, Vancouver Island, bringing the capacity up to 168,000 h.p. Construction has continued at Bridge River, toward the installation of the fourth 62,000 h.p. unit for operation in 1954. Several other projects are also in hand. Also scheduled for early 1954 operation is the Waneta plant of the Consolidated Mining and Smelting Co., where two 105,000 h.p. turbines driving 90 MVA alternators are to be installed.

On the Alcan scheme at Kemano-Kitimat, the 10-mile, 25 ft diameter diversion tunnel from Tahtsa Lake and the penstock tunnel were expected to be complete by the end of 1953. The power-house is finished and the work of installing the three 140,000 h.p. turbines and 106 MVA generators is well advanced. Operation is scheduled for May of this year. No definite commitment beyond the present installation of 420,000 h.p. has been made although the ultimate capacity may be over 2,000,000 h.p.

Ontario

In addition to completing the final stage of its series of post-war developments on the Ottawa River, and the building of the large steam plants at Toronto and Windsor, the Hydro-Electric Power Commission of Ontario was actively engaged on its new development on the Niagara River at Queenston, which is the largest project it has ever undertaken.

Construction of the Otto Holden station is now complete, the eighth 33,000 h.p. unit having been placed in service in April 1953. At the Queenston project, the Sir Adam Beck-Niagara generating station No. 2 is well advanced and the first units are expected to go into operation early in 1954. Excavation of Tunnel No. 1 has been completed and lining should be finished. Tunnel No. 2 is also well advanced as the excavation is nearing completion and concrete placing has been started.

At the power-house, four penstocks have been erected and about a quarter of the concrete for the penstock saddles and envelopes has been placed. Two-thirds of the steel for the power-house superstructure has been erected and about half the concrete placed.

During 1953 the Commission amended the programme of work to provide for a pumped storage scheme, and later for a further four additional generating units to be installed when required. A storage reservoir of about 15,000 acre ft, adjacent to the forebay, will be created by the building of a dyke, and a pump-turbine plant will be built to raise water to this reservoir. This plant will operate as a generating station when water is being discharged from the reservoir, and will have a capacity of up to 170 MW. This will permit optimum use to be made of the Sir Adam Beck-Niagara generating stations, as the reservoir will be filled at night, and the impounded water used during the day time. The four additional units in the No. 2 power station will not, however, be installed until high load factor sources such as the St. Lawrence project, and thermal power plants have been developed. At the moment, therefore, the station is scheduled for 12 units with a total h.p. of 1,260,000.

At the Richard L. Hearn station, all four generating units are now in service, the fourth set having been commissioned in June 1953. It may be recalled that originally two of the units generated at reduced power at 25 c/s. No. 1 of these has now been changed over for 60 c/s operation, and the present installed capacity is now 388 MW composed of three 60 c/s machines and one 25 c/s machine. When the remaining 25 c/s unit is changed over, the station will attain its final capacity of 400 MW. The other major thermal station, J. Clark Keith, at Windsor, is also complete with a total capacity of 264 MW made up of four 66 MW units.

Quebec

The rapid expansion of industrial activity in Quebec has required further construction of new generating stations. At Beauharnois on the St. Lawrence, the Hydro-Electric Commission added two more units, one of 55,000 h.p. and one of 56,000 h.p. which brings No. 2 station to its planned capacity of 666,000 h.p. and the overall capacity to 1,408,000 h.p. Ultimate capacity of the site is estimated at about 2,000,000 h.p. Construction was begun on the Bersimis River scheme, which will have an initial capacity of 300,000 h.p. with an estimated available potential of 1,200,000 h.p. At Chute à la Savanne, Alcan completed the 285,000 h.p. development comprising five units of 57,000 h.p.

Price Bros. and Co., Ltd., late in the year completed its two plants on the Shipshaw river. The Jim Grey station at Chute-des-Georges has a capacity of 70,000 h.p. in the two units, while the Adam Cunningham station at Chute-aux-Galets is 9,000 h.p.

The Manicouagan Power Co., a subsidiary of the Quebec North Shore Paper Co., brought into operation in the earlier part of the year the second unit of 56,200 h.p. The plant is designed for six units in all, and the others will be installed as required.

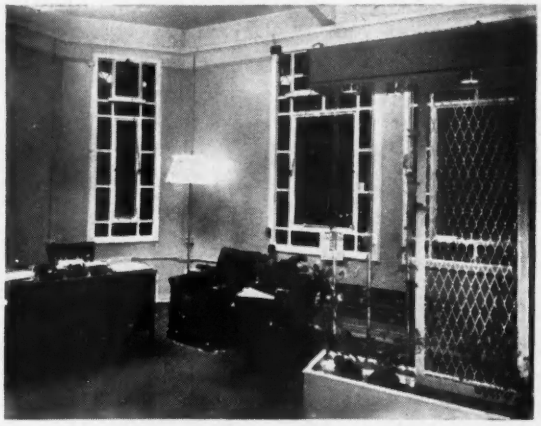
These are, of course, only some of the more important plants in Canada. Many other projects are being actively pursued or have been completed in other Provinces.

Copies of the bulletin (No. 2402) giving progress details can be obtained free on application to Chief, Water Resources Division, Ottawa.

E.L.M.A. activities in 1953

A year of continuous expansion in progress toward better lighting is reported by the Lighting Service Bureau

THE Lighting Service Bureau has had in 1953 a year of great expansion in the demand for publications, lecture work, and in advisory services. In the shop lighting field, the work of Mr R. L. C. Tate, F.R.S.A., has been of particular importance, and he has given lectures in many of the provincial towns as well as several London engagements. In addition to lecture work, he has taken every opportunity of obtaining informed opinion on the special lighting requirements of a number of differing trades. In this connection, colour matching fluorescent lamps are proving extremely popular and are now being far more widely used for general and shop window lighting than was originally visualised.



Industrial consultation is more frequently required from the Bureau's Area Engineers than from the London headquarters. Many indications have shown that the integration of light and suitably coloured surroundings is no longer regarded as the novelty that it was when in 1944 the Bureau helped to stage, in conjunction with the Cotton Board, one of the first exhibitions of light and colour.

Some 20% of the 453 lectures given by members of the Bureau staff in 1953 were on home lighting, and almost every woman's organisation of note has been in touch with Miss M. D. Wardlaw, the Bureau specialist on the subject. Throughout the country there is a growing interest in fluorescent lighting for the home, but the major demand has continued to be for filament lamps and is likely to continue so for many years to come.

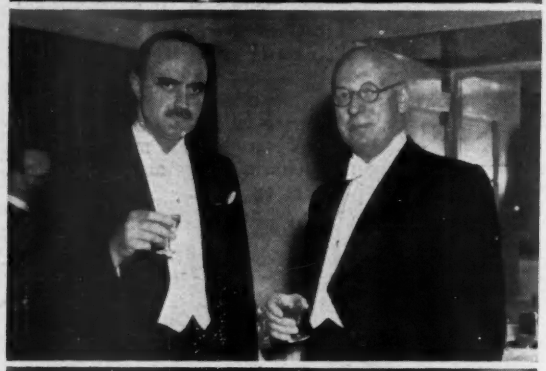
Provincial Offices

The Bureau now has premises in Leeds, Glasgow, Birmingham and Newcastle upon Tyne, all of which have demonstration facilities. During the year a part of the Scottish Bureau has been reconstructed to make room for a greater number of demonstrations and the Birmingham offices have been converted for Bureau demonstrations, one room for general principles and the other for decorative lighting.

For the first time, in 1953, it became the rule for the Bureau to make a small charge for publications, as it was felt this might deter the purely acquisitive. This step had been advocated for some years but had been constantly postponed as it was felt that it might limit the spread of information. It has, however, had no noticeable effect on distribution.

Above is a view of the interior of one of the rooms at the reconstructed Birmingham offices, formerly occupied by the British Electrical Development Association

The demonstration room at the Scottish Bureau sets the tenor of the work on lighting being carried out by E.L.M.A.



Contractors' Viewpoint

Technical and labour problems are reviewed at E.C.A. Dinner

THE general health of this Association is excellent. This confident statement, received with general applause, set the tone for the speech of Mr S. L. M. Barlow, the President, at last week's annual dinner of the Electrical Contractors Association. Mr Barlow was replying to the traditional toast "The Allied Associations and Honorary Officials," which had been proposed by Mr J. R. Bevins, M.P., Parliamentary Secretary, Ministry of Works.

After thanking Mr Bevins, Mr Barlow went on to remark that the contracting section of the electrical industry, like other trades, was still lagging behind in the field of production. In the building industry, which reflected contracting experience, production had increased only 4% since 1948. If pre-war figures were compared with those of the present day, the seriousness of the position would be made apparent. 1948 was a year made difficult by material shortages which no longer existed.

The urgent need today was for the restoration of the will to work and pride of craftsmanship. "Let me say at once," went on Mr Barlow, "that this Association has an honest and genuine desire to ensure that all employed with our members may enjoy a high standard of living and may share in the prosperity of our industry, but that it is my considered view that the prolongation of this dispute, whether by so-called 'guerilla' or other tactics, is steadily deprecating these objectives." He felt that the only sensible course was to obtain an immediate and equitable

The three photographs on the left show, top to bottom, Messrs S. L. M. Barlow, President, E.C.A., and J. R. Bevins, Parliamentary Secretary, M.o.W.; Mr H. Bishop chatting with Mr H. T. Young—present and past presidents of the I.E.E.; Messrs J. G. Briggs (Past President, E.C.A.), C. J. W. Scott (Chairman, E.L.M.A.) and M. Sadler (Vice-President, E.C.A.) Below, right, Messrs N. Aish, P. Wallis, J. Halliwell and S. Watkins (all of the E.C.A.) and Mr W. J. Jones (E.L.M.A.). Left, Mr E. R. Wilkinson, Mr T. E. Alger (Past President, E.C.A.), Dame Caroline Haslett, and Mr E. Long (B.E.A.)

settlement through the good offices of some independent and unbiased third party, and he appealed "with great sincerity" to the E.T.U. to join with the Association in sinking mutual differences, and in endeavouring to work together as a team. Since the war the Association had granted many benefits for its operatives such as holidays with pay. The stage had been reached, however, where neither public nor employers could bear additional costs.

Turning to domestic matters, the President expressed the hope that spectacular progress would soon be made in such fields as the clarification of spheres of activity as between manufacturers, wholesalers and electrical contractors and retailers. It was high time that at least some of the requirements of British Standard Specifications were made mandatory so that the public was not exposed to the hidden dangers of shoddy electrical appliances. In a related matter, the Association welcomed the activities of the B.E.A. and the area boards towards establishing a national code of safety in the field of installation work. For too long the prerogative of deciding safety had rested with individual inspectors. In conclusion, on this theme, Mr Barlow suggested that the Government should appoint a small representative committee whose duty would be to explore the whole subject of the unrestricted sale of electrical accessories.

The Parliamentary Secretary, making the first speech of the evening, had devoted most of his attention to the threat offered by increasing overseas competition. Our ability to export depends largely on matters within our own hands—quality, delivery dates and costs.

Some 680 members and guests of the Association sat down to dinner, and ranged along the top table were many personalities from the electrical and associated engineering interests. The task of proposing the toast to "The Guests" was in the able hands of Mr M. Sadler (Vice-Pres., E.C.A.).

First of the guests to respond was Mr H. Bishop, President of the I.E.E., who appropriately enough dwelt on the connections between the Institution and the Association. He took up Mr Barlow's remarks on shoddy apparatus and installations, saying that the way in which the I.E.E. could help was in the issue of wiring regulations. These have been applied loyally and on a voluntary basis, making a big contribution to standards of installation work.

The Electricity Regulations did not require installations to comply with the I.E.E. wiring regulations, though they did provide that installations complying with the wiring rules had to be connected. As a consequence, in many area boards there were codes of minimum requirements quite separate from the I.E.E. wiring rules. It was felt by the Institution that this was an unsatisfactory situation, and so a friendly arrangement had been reached that the Institution should provide a basic code in the wiring rules.

To this end the 13th edition of the rules, on which work was about to start, would be recast in such a way that it would consist of two distinct parts. The first would be a basic code to serve undertakings and would set out the basic conditions for meeting the 1937 regulations. The second part would consist of a detailed code of methods to be used and alternatives available which were recommended practice for complying with Part I. In this new edition there would, of course, be no reduction in the high standards of safety that had always been a feature of the regulations.

A far different theme was adopted by the other speaker for the guests, Sir Percy Mills (the President, Engineering and Allied Employers' Federation). He expressed forthrightly his admiration for the courage and toughness with which the Association was facing the labour situation.

Mr L. C. Penwill, Director and Secretary, E.C.A., talks with Mr G. W. Grosvenor, President, National Fedn. of Building Trades Employers

Below, left: Messrs W. Harrison-Watson, H. T. Wesker, T. Dunwoody, Dr H. H. Ballin, and Mr G. F. Keene. Right: Mr. J. E. Schofield (Chairman, British Synchronous Clock Conference), Col. J. Banks, Mr J. R. Bevins and Mr P. T. Fletcher (Chief Engineer, M.o.W.)

Research on Diesels

THE OLD AND THE NEW ON VIEW AT RUGBY

A VISIT was recently paid to Diesel Research Station of the English Electric Co. at Rugby. This large well-equipped station contains engines totalling some 6,500 h.p. in output, for development running. For dual-fuel and gas development, an engine from each of the two main types manufactured by the Diesel Division is used, one a 4 RKD 10 in. bore by 12 in. stroke engine, and the other a 5 RLD 15 in. bore by 20 in. stroke engine. Multi-cylinder turbo-charging research is carried out on a 10 in. bore 16 SV "V" type engine, and long-term endurance tests on a 12 SV engine. A variable speed eight cylinder "V" engine, also 10 in. bore, is being utilised for development on naturally-aspirated types. In the 15 in. bore range, a 5 SRL engine is being utilised for high output development. Further engines will be installed in the near future as they become necessary for other higher performance research work.

Output from this wider range of machines is absorbed either by water brakes—for which a pressurised water system is available—or by generators which feed into the works a.c. and d.c. systems. Where the speed is non-synchronous and an a.c. generator is in use, the load is fed into water resistances.

Fuel is stored in a large tank farm, and supplied to the Research Station through two fuel ring mains, one of which is heated for heavy fuel oil. Town's gas is also available, and a gas booster house has been built to permit supercharged gas-engine tests to be carried out.

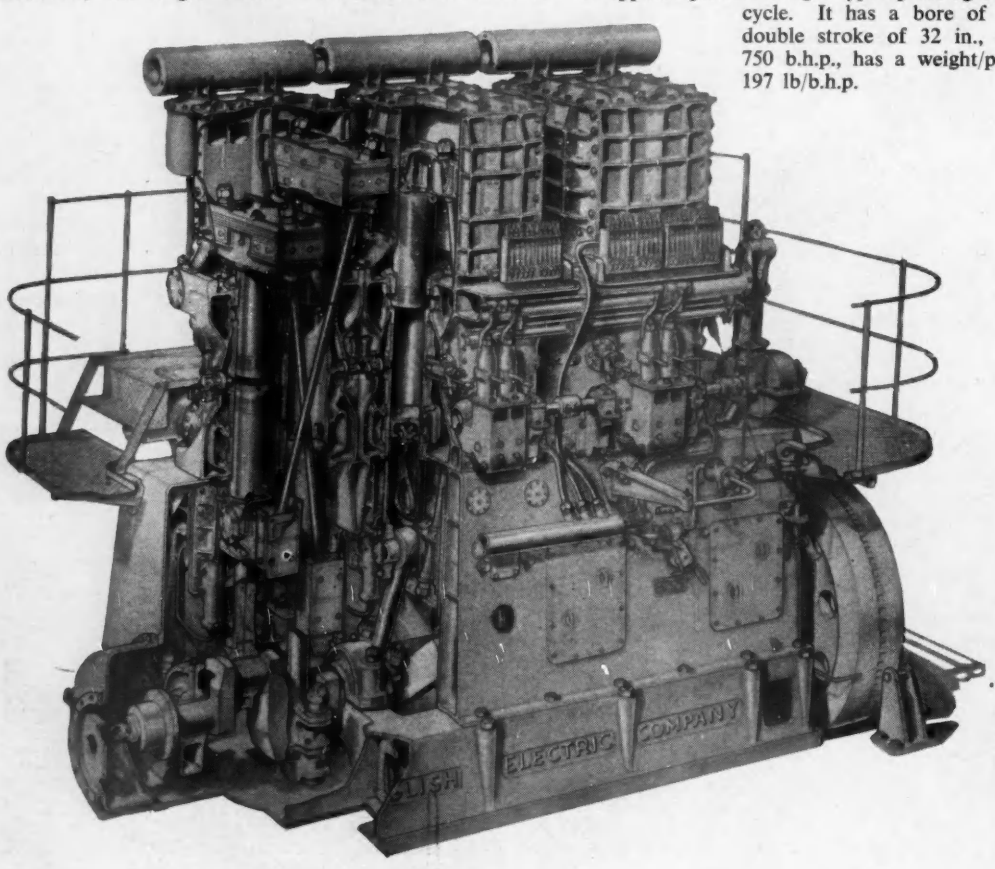
Extensive instrumentation has been installed, some of it on a permanent basis, and in addition the Section maintains a central pool of more special instruments. The research techniques involve electronic pressure indicators, infra-red gas analysers, contact method piston temperature indicators, flow meters for air and fuel and many other types.

Historic Machines

Three engines, having an aggregate number of operating hours in the region of 300,000 were also on view. These are fitted with air-blast fuel-injection equipment, as opposed to the mechanical fuel-injection equipment fitted to modern compression-ignition engines.

The oldest of the trio, No. D15, made in 1912, is a 3-cylinder engine with a bore of 20·1 in. and a stroke of 28·38 in. Weighting some 67 tons and with an output of 480 b.h.p. the engine has a weight/power ratio of 312 lb per b.h.p. The second unit, a 4C diesel, was manufactured in 1917 and is rated at 500 b.h.p. to give a weight/power ratio of 264 lb per b.h.p. These engines were the first units of their type to be constructed and during the 1914-18 war were fitted with pilot ignition equipment to enable them to run on tar oil.

The last of the three engines, manufactured in 1921, is an opposed-piston Fullagar type operating on a two-stroke cycle. It has a bore of 14 in. and a double stroke of 32 in., and, rated at 750 b.h.p., has a weight/power ratio of 197 lb/b.h.p.



Semi - sectional drawing of English Electric Fullagar Type 6Q engine

Seeboard Use

A Simple Post Hole Borer for Rural Lines

WITH the drive now being undertaken by many of the area boards toward the economic completion of rural electrification, any device or machine which can accelerate progress must naturally be worthy of consideration. Such a device is the Taymen post hole borer, produced by Taymen Ltd., Kingswood, Surrey.

The prime mover required is the standard Ferguson tractor, and one of the essential features is that the post hole borer and the crane can quickly and easily be removed to free the tractor for other work. Further, as the tractor itself is a well-known agricultural implement, its presence is not resented by the farmer over whose land it has to travel, and it can generally cover any field positioning.

Two additions only are required: the Horndraulic crane lift—a standard accessory—and the Taymen borer. The former of these needs modification as its use is automatically extended by its application to post erection and comes under the category of industrial lifting gear.

The most interesting part of the gear is however the post hole borer. This is fitted to the back of the tractor and comprises a fabricated steel framework carrying the drilling auger and shaft, driving hydraulic motor, steady bearing and locating gear. As can be seen from the photographs the equipment is fairly straightforward, the vertical movement of the shaft being controlled by a steady bearing at the lower end and by locating rollers running on the side members at the top. The hydraulic ram on the near side of the framework is used for lifting the boring assembly, the weight of the motor, gearbox and tank and shaft being ample to take the auger down.

Power for the hydraulic motor is derived from a hydraulic pump driven off the tractor's power take-off through a chain drive. The pump provides a continuous (as compared to a pulsating) output, and a safety valve is incorporated in the pressure line near the motor.

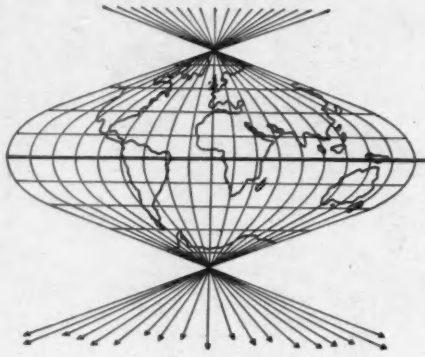
The boring shaft speed runs at 55 r.p.m. with a hydraulic motor speed of 1,500 r.p.m. A simple robust gear box effects the necessary reduction, and also provides the necessary reverse drive.

The equipment is most suited for farm and rural electrification involving the erection of some dozen or so poles. In normal soil it can, with three men, erect three times the number of poles in the same time as six men would do it manually. Normal capability of the machine is for holes up to 6 ft 6 in. depth, 1 ft 6 in. dia. If necessary a 2 ft dia. auger can be fitted.

Using a petrol tractor, the whole equipment can be supplied complete for £939, being made up of £405 for the tractor, £398 for the borer, and £136 for the loader.

The design was carried out by J. V. Taylor, and tests and advice were provided by the South Eastern Electricity Board, to whom we are indebted for the pictures.

View of the borer to show general arrangement and auger. In the heading block, the pole would normally be fitted with insulators and ironmongery



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Power in the Yukon

British Columbia is opposed to piecemeal development of the vast hydro-electric resources along the Yukon border. Announcing this, Premier W. A. C. Bennett has said he would give preference to plans concerning the development of water power and industry in the northern part of his province from concerns which could make specific proposals for the full development of resources within a specified time. The Aluminium Company of America, and Frobisher Ltd. seek water rights in the territory. The Federal Government has control over the Yukon portion of the water rights, but British Columbia controls more than half the rights within the northwestern section of the province. Surveys show sufficient water for a potential development of 5,000,000 h.p. in hydro-electric power. We have already reported that Frobisher, planning a big metallurgical industry, have made tentative plans to spend $15,000,000 in a first-stage development of 100,000 h.p.

Submarine Power Line

The British Columbia Electric Co. has now applied for permission to begin work on one of the largest submarine power projects in the world. It is proposed to lay a 132 kV underwater cable from a point south of Vancouver on the B.C. mainland to a point south of Nanaimo on Vancouver Island a distance of 19 miles. Cost of the scheme is estimated at about $5 million, and if the provincial Public Utilities Commission gives its approval, the company proposes to start work almost immediately. The cable is being supplied by British Insulated Callender's Cables Ltd., we understand.

Rural Electrification

By the end of 1953 the Manitoba Power Commission had connected more than 39,000 of the province's 52,000 farms, it is stated. The Commission's rural electrification programme, launched on an experimental basis in 1945, has one more year to go. The 1954 programme is for the addition of 2,500 farms services and 18 hamlets of small population, bringing to 492 the number of population centres on its system. Even with the completion of its 1953 programme which provided for the connection of 5,217 farms, Manitoba is now relatively the most completely electrified province. By the end of the fiscal year, 75% of Manitoba farm homes will be connected to the system, it is estimated, and well over 90% of people in the province will be getting, or able to get, power.

Work in Winnipeg

The McArthur Falls hydro-electric scheme of the Manitoba Hydro Electric Board is now expected to be in operation about the end of this year. At the moment the project is about half completed. Started just over a year ago, the plant will have eight 10,000 h.p. generators. A 63-mile long transmission line will take the power in from Lac du Bonnet to Transcona. Cost of the McArthur scheme is put at $23½ million compared with about $24 million for the Pine Falls 114,000 h.p. plant which was completed late in 1951. The next large power development in Manitoba is likely to be at Grand Rapids at the northern end of Lake Winnipeg. But this scheme will be still more expensive, owing to the rather more remote site, and will entail the construction of a 250-mile-long transmission line to Winnipeg.

U.S.A.

T.V.A.'s Plea

Even if arrangements can be made to relieve the Tennessee Valley Authority of 600 MW of the Atomic Energy Commission's load, the region will face an exceedingly tight power situation in 1957. This is the opinion of Mr G. R. Clapp, chairman of the T.V.A. Board. He was commenting on President Eisenhower's budget recommendations to Congress. He said the absence of any funds in those proposals for starting new generating capacity in the T.V.A. system was based on the assumption that new defence loads would not develop and that the Atomic Energy Commission would secure from non-T.V.A. sources the 500 MW to 600 MW that the Authority was now committed to supply at Paducah from generating plant now under construction. Any T.V.A. capacity released by the Commission would thus be available for other regional power needs. The Authority had been told by the Bureau of the Budget that if the Commission failed to arrange to obtain this power from other sources, the question of providing additional T.V.A. plant would be reconsidered, he added.

EUROPE

A Plan for Greece

In Greece, an agreement was recently signed by the Italian Minister of Industry and Commerce, under which the Italian Government have agreed to Italian firms supplying capital goods for the Greek Recovery Programme to the value of $15 million, repayable over a period of five years or more. They have also agreed that this figure may be increased to $25 million if the construction of certain hydro-electric projects is given to Italian firms. The additional Protocol states particular Italian interest in the Acheloos project, which includes a hydro-electric plant of 180,000 kW. This Protocol says that if this project is given to Italian firms, the Greek Government will devote to it $15 million which it has in Italy from Reparations in accordance with a Greek/Italian Agreement of 1949. A mixed commission of three Greeks and three Italians is to be set up to implement this agreement.

MIDDLE EAST

Israel Attitude Explained

Answering criticism that the Israeli Government's proposed deal with the Palestine Electric Corporation Ltd. (to which were referred on 10 Dec.) smacked of nationalisation and might deter potential investors, Dr Dov Joseph, Minister of Development, has said that the Cabinet came to the decision to buy out the company with great reluctance. The Government preferred that private capital continued to finance development of power works, he said, adding that the Palestine Electric Corporation had failed to raise the necessary capital in Britain and the U.S. Since the creation of the State, the Government had advanced to the Corporation $20 million for expan-

sion of its power facilities. The Government's current plans called for increasing the generating capacity from 230 MW to 420 MW by 1958 at a cost of $65 million. He emphasised that what the Government were doing was not nationalisation. Nationalisation implied expropriation without consent of the owners at a price imposed by the Government. But the present agreement was a voluntary one between owners and the Government, and the price had been fixed by negotiations, he stressed.

Lebanon Scheme

The Lebanese Premier has stated that the arrangements for the Litani River hydro-electric scheme have already been completed. He said the Government had formed a company, with a capital of 100 million Lebanese lira, to undertake the implementation of the scheme. Of that sum, 55 million lira will be subscribed by the Government and the remainder by individuals and concerns.

AFRICA

Kenya Schemes

Work is well under way on the Low Tana scheme of the East African Power and Lighting Co. In this project which will have two 4,000 kW Francis turbines, the waters of the River Tana are being dammed at Merila, and fed into a 9,000 ft tunnel to the power stations. Along with the 8,400 kW Wanjii scheme, the major part of which was put into operation last April, the company is spending about £2¼ millions on these projects to meet the increasing demands in Nairobi and the surrounding area.

S.W. ASIA

Loan for Ceylon

The World Bank has agreed to provide a loan of 104 million rupees to the Ceylon Government to meet the full foreign exchange cost of stage II of Ceylon's Norton Bridge hydro-electric scheme. But one condition of the loan is that the Ceylon Government should form a statutory corporation to manage the hydro-electric scheme, we understand. Another of the conditions is that the government should meet the full domestic cost of the project (estimated to amount to about 46 million rupees).

Calcutta Railways

Electrification of the railway services on the Burdwan-Bandel-Howrah main line under the proposed Indian Government scheme is expected to be completed in three years from now. The second phase of the project, which will be undertaken afterwards, will take another two years. Electrifications of the remaining portions of the Calcutta suburban services (on the Sealdah section) will again be split up into two stages and is likely to be carried out five years hence. The proposed Calcutta circular railway will be included in the third phase which will also bring within its scope the services on the southern section of the Sealdah line. The last stage will relate to the Sealdah-Naihati section. These details were given after a conference of officials recently, when the Railway Board was assured by representatives of the Damodar Valley Corporation and the Calcutta Electric Supply Corporation Ltd. that they would be able to supply all the power necessary for the electrification of the services. An understanding was reached about the sections to be served by those agencies. The D.V.C. would be responsible for the areas west of the Hooghly and the C.E.S.C. for services operating on the Sealdah section. The total power requirement for the electrified Calcutta suburban railways was estimated at 50,000 kW a day. The D.V.C. would be expected to supply 30,000 kW to feed the services on the Burdwan-Bandel-Howrah main line and 10,000 kW for the Burdwan-Howrah-chord Line. The requirement from the C.E.S.C. was estimated at about 10,000 kW.

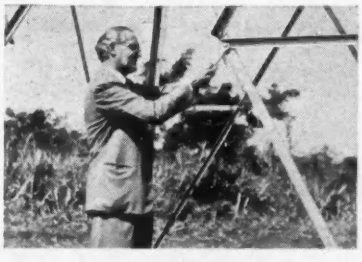
AUSTRALIA

Acquisition

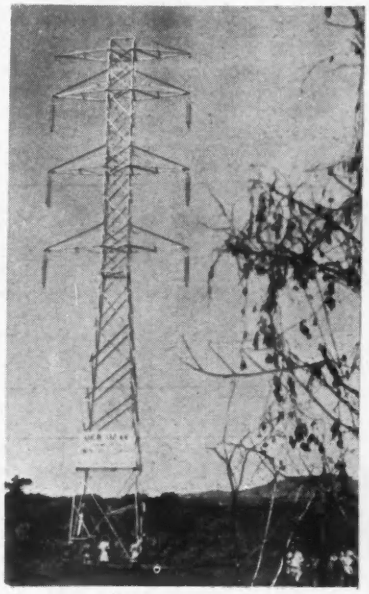
The Guildford Municipal Council, Western Australia, has accepted the State Electricity Commission's offer of £16,000 for its electricity undertaking. South Perth is now the only local authority in that region which has not yet completed its claim concerning acquisition of its electricity supply undertaking.

Changes in N.S.W.

The end of April next will see the expiral of the existing agreement between the Newcastle City Council, New South Wales, and the State Railways Department which provides for the city council taking a bulk supply from the Railways' Zarra St power station. At that date too, control of the Zarra St power station will pass to the Electricity Commission of New South Wales. At last month's meeting of the Newcastle City Council it was agreed to review the question of electricity tariffs at the end of April, although it is estimated that the Electricity Supply Department will incur a deficit of about £168,000 in the current financial year.



The first 132 kV overhead transmission line in East Africa is now being constructed for the Uganda Electricity Board by British Insulated Callender's Construction Co., and work is already well advanced. Our photograph above, taken at an informal ceremony recently, shows Mr C. R. Westlake, chairman of the U.E.B., tightening the last nut on the first erected tower to be completed. This line of approximately 120 route miles is in two sections and runs westward from the Owen Falls hydro-electric project to Kampala, and eastwards from Owen Falls to Tororo, close to the Kenya border



NEW ZEALAND

Finance Needed

To finance the extension of its network into the Inangahua county, the Gray Electric Power Board, New Zealand, is to seek a £15,500 loan. The Board is also considering erecting a £6,000 new line to the Runango district for mining and domestic use to meet the increasing demand in that area.

Is it Poaching?

An interesting little argument has arisen in the South Island, New Zealand, between the North Canterbury Power Board and the Kaiapoi Borough Council Electricity Department, both of which operate electrical contracting work. It seems that the Kaiapoi Electricity Department was the successful tenderer for the wiring of a milk treatment factory within the area of the North Canterbury Power Board. The latter thereupon wrote to the council drawing attention to the practice that had arisen of the council's wiring department's activities being extended into the Board's supply district. As far as the board was aware such operations were restricted to the supply district of the Authority concerned. Such restriction of activities to the supply authority's own area was, the board considered, a matter of ethics, and it was a necessary factor for the maintenance of good relations between neighbouring supply authorities and their staffs, they emphasised.

Personalities IN THE INDUSTRY

This week **Mr W. J. Prior,** A.M.I.E.E., has taken up his new duties as power station superintendent at Keadby generating station, Yorkshire Division, B.E.A. He has already had two years' experience in Keadby, first as shift charge engineer, then boiler house superintendent, and since May 1953 as deputy station superintendent there. Mr Prior had earlier served as shift charge engineer successively at Barugh, Mexborough and Stuart St power station, before going to Stockport generating station in May 1951 as operation engineer, leaving there the following January to go to Keadby.

Mr W. J. Prior

Mr M. Parkinson

Dr W. A. Macfarlane

Mr C. C. Hyams, proprietor of Albert Geall, electrical contractors, of Hove, has been elected president of the Brighton and Hove Chamber of Commerce.

The Minister of Fuel and Power has re-appointed **Sir George Gater,** G.C.M.G., K.C.B., D.S.O., J.P., as a part-time member of the London Electricity Board.

Mr R. B. Whitelaw, A.M.I.STRUCT.E., has been appointed a senior assistant engineer (civil) in the London Division of the B.E.A. Following experience with Sir Wm. Arrol and Co., Ltd. he joined the London Power Co., Ltd. in 1938, and after vesting date became a 2nd assistant engineer in the chief generation engineer's (C) department of the Division.

Mr Michael Parkinson, M.A., has been appointed general manager of the Guiseley Works of Crompton Parkinson Ltd. The son of Mr Albert Parkinson, M.B.E., now chairman of the company, Mr Michael Parkinson, who is 26, joined Crompton Parkinson Ltd. in July, 1950, as a trainee in the production and other engineering departments of the company's works. In 1951 he was a member of the Crompton Parkinson Productivity Team which visited the United States and, at the conclusion of the tour, he remained for a further period of special service in the U.S. and Canada. He recently visited Crompton Parkinson factories in Australia and South Africa. Since his return he has been at Guiseley gaining first-hand practical experience. He is assistant to the works director north, and will retain that position. Mr Parkinson was co-opted to the company's board of executive directors in March, 1953, after serving on the junior board from March, 1952.

London Transport announces that **Mr R. C. Hider,** M.B.E., B.COM., M.INST.T., has has been appointed Divisional Superintendent "A" Division (Metropolitan and Bakerloo Lines) in the Department of the Operating Manager (Railways).

At the recent annual dance of Nettle Accessories Ltd., **Mr L. S. Hargreaves,** chairman, was presented with a silver cigarette box by **Mr F. Whittingham,** night shift foreman, on behalf of employees of Nettle Accessories Ltd., to commemorate the anniversary of the founding of the parent company, Aerialite Ltd., of which Mr Hargreaves is chairman and managing director. At the function Mr Hargreaves also presented a silver cigarette case to Mr Whittingham in recognition of the latter's 25 years' service with the firm.

Leader of the British Scientific Mission to the U.S.A., **Dr W. Angus Macfarlane,** has been appointed as general manager of the recently formed National Industrial Fuel Efficiency Service. Dr Macfarlane flew back to the U.S.A. last Thursday to hand over to his successor. He will take up his duties with the N.I.F.E.S. in March. In Washington, Dr Macfarlane has been responsible for keeping the civil departments of the British Government and the Industrial Research Associations informed of progress in research and development in North America. He graduated at Balliol and then spent two years at the University of California where he gained his Ph.D., returning to join the Fuel Research Station of the D.S.I.R., from which he took up an appointment as senior chemist with the L.M.S. Railway under his old tutor, Sir Harold Hartley. Later, joining the Ministry of Fuel and Power, he became the first Director of Fuel Efficiency, holding that position until 1948 when he was appointed to his present position.

Ekco-Ensign Electric Ltd. announce that **Mr A. Miller** has been appointed Midlands area manager and is now operating from their Birmingham sales office.

Dr E. W. Still has been appointed technical director of Normalair Ltd. He succeeds Mr W. M. Widgery, who has resigned from the Board. Dr Still was previously research and development manager of Teddington Controls Ltd., and prior to that chief project engineer with Rolls-Royce.

At Nettle's function : Left to right Mr A. Ferguson (production director), Mr L. S. Hargreaves, Mr F. Whittingham, and Mr D. Revington (managing director)

Mr G. Lloyd Jones has been appointed manager of the British Thomson-Houston Co.'s Cardiff district office with effect from 15 Feb., to succeed **Mr A. F. MacCarthy,** M.I.E.E., who is retiring. Mr Lloyd Jones received early training and technical education at Bangor, and after war service joined the B.T.H. Rugby Works for a special course of training leading to a staff appointment as a commercial engineer in 1922. In 1926 he was transferred to the B.T.H. Middlesbrough district office, being appointed manager in 1936. Mr MacCarthy gained his technical education at Manchester College of Technology and early practical training with Harland and Wolff, Belfast. After service in the first World War he joined the staff of the B.T.H. Manchester district office. In 1941 he was seconded for duty as deputy chief electrical engineer to A. V. Roe and Co., who at that time were very heavily employed in the vital aircraft expansion programme. At the end of the second World War Mr MacCarthy rejoined the B.T.H. company and in 1945 was appointed manager of the Cardiff district office.

Right: Mr G. Lloyd Jones who becomes manager of B.T.H. Cardiff district office

Left: Mr A. F. MacCarthy who is shortly retiring

We hear that **Major H. S. Bullard,** M.B.E., A.M.I.E.E., ASSOC.I.MECH.E., senior mechanical and electrical engineer with the Salisbury Municipal Electricity Department, Southern Rhodesia, has been appointed generation engineer in charge of the undertaking's power stations. Major Bullard informs us that he will be visiting the United Kingdom for three months on business in June next, and communications may be addressed to him c/o Rhodesia House, Strand, London, W.C.2.

Mr G. W. Gibson, managing director of Fry's Metal Foundries Ltd., was recently presented by his fellow directors with a silver salver to mark the completion of forty years with the firm.

At the annual dinner and dance of H. D. Symons and Co., Ltd., held recently, **Mr H. D. Symons** was presented by the employees with a silver cigarette box and lighters to mark the completion of his 35 years of managing director to the company. Mr Symons, who is a founder of the company, has assumed the chairmanship and his son, **Mr M. D. Symons,** has succeeded him as managing director.

Mr H. D. Symons, left, receiving the presentation from Mr G. W. Wadsworth

Our accompanying photograph shows **Mrs Edna Prophet,** of the North Western Electricity Board, Chorlton-on-Medlock, receiving the Elizabeth Sloan Chesser Cup from **Dame Caroline Haslett,** D.B.E., J.P., COMP.I.E.E., director of the Electrical Association for Women, at the E.D.A./E.A.W. Housecraft Advisers Conference last week. In our last issue we noted that Mrs Prophet had gained the award for obtaining the highest number of marks in the E.A.W. Diploma in Electrical Housecraft.

The Elizabeth Sloan Chesser cup is handed to Mrs Prophet by Dame Caroline

Formerly agricultural assistant in the Bournemouth sub-area office of the Southern Electricity Board, **Mr J. T. Taylor,** A.M.I.B.A.E. has this week taken up his new post as agricultural engineer to the British Thomson-Houston Co., Ltd.

At present station superintendent at Skelton Grange power station, Yorkshire Division, B.E.A., **Mr H. Bancroft,** A.M.I.E.E., has been appointed generation engineer (operation) with the Midlands Division. Mr Bancroft went to Skelton Grange at the end of 1950 and was responsible for the commissioning of that station. Earlier he had been boiler house superintendent at Kirkstall power station, Leeds, for about 18 months. Educated at Halifax Secondary School and Halifax Technical College, he served in the town's power station from 1931 to 1937 when he became relief engineer-in-charge at the Derby Electricity Works. Two years later he took up the position of combustion engineer to the Kent Electric Power Co. at Littlebrook power station, where he served as engineer-in-charge from 1944 to 1947. From that time, till going to Kirkstall in 1949, he was at the Halifax generating station, first as assistant power station superintendent, and afterwards as power station superintendent.

Mr E. N. Robinson, deputy chairman of A. Reyrolle and Co., Ltd., has been appointed a director of C. A. Parsons and Co., Ltd.

Long service awards were last week presented to two employees of the South East Scotland Electricity Board, who have each served the industry for 35 years. They are **Mr A. Morgan** and **Mr J. Buist** (brother of Mr D. Maxwell Buist, of B.E.A.M.A.). Mr Morgan served with the Kirkcaldy undertaking prior to vesting date, being responsible for meter testing; and in 1948 was appointed meter superintendent at the Victoria Works. Mr Buist started with the Fife Electric Power Co. and later he transferred to the Meter Testing Department at Thornhill. He is still serving with that department in Kirkcaldy. The presentations of a television set to Mr Morgan, and two easy chairs to Mr Buist, were made by **Mr C. H. A. Collyns,** manager of the board's Fife sub-area.

OBITUARY

Mr Frank Griffiths, who had been engineer in charge of the London office of the State Electricity Commission of Victoria since October, 1949, died on 30 Jan., aged 50.

Mr M. M. Wyatt, A.M.I.E.E., who died on 25 Jan., was formerly with the Southern sub-area of the London Electricity Board, for a time as acting local manager. Prior to nationalisation of the industry he held various appointments with the London Electric Supply Corporation Ltd., being deputy engineer from 1935 to 1947.

Mr G. E. Taylor, A.M.I.E.E., who retired last November from the position of technical investigation officer (electrical) with London Transport, died in Johannesburg on 18 Jan.

Mr Karl B. McEachron, who died on 24 Jan. at Pittsfield, Mass, aged 64, was a pioneer in lightning research for the General Electric of U.S.A. He supervised the construction of the firm's high voltage laboratory, and in 1933 was appointed head research engineer in h.v. practice, a position he held until 1945, since when he had been assistant works engineer.

Equipment for Industry

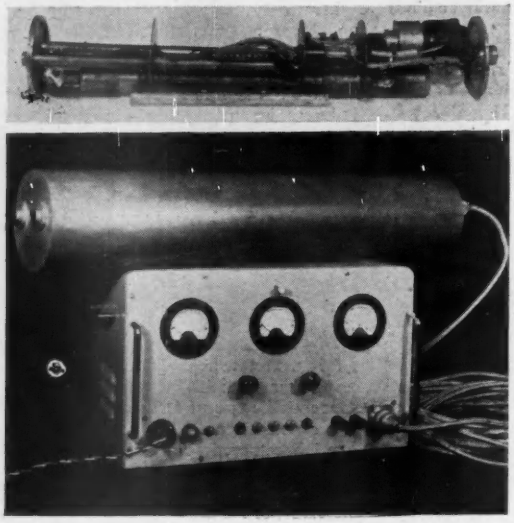
Photo-electric Dust Meter

TO ensure high operational efficiency of steel works plant, it is essential that the blast furnace gas be kept free from dust. Particles suspended in the gas reaching the coke oven battery tend to form a deposit on the refractory brickwork, which, by sintering, eventually produces an insulating layer preventing efficient heat transference. Continued dust deposition, moreover, can eventually block the gas path through the refractory, necessitating complete re-bricking.

Measurement of dust concentration is usually performed by gravimetric methods, which, though accurate, gives no indication of the uniformity of dust concentration over the measuring period. This difficulty, however, has been overcome by the development of a continuously recording instrument manufactured by RADIOVISOR PARENT LTD., 1 Stanhope St, N.W.1. Capable of monitoring gases at any joint in the main, the unit may be calibrated with standard gravimetric measurements and to suit site conditions, whilst provision can also be made for an alarm to be given if a pre-determined dust concentration is exceeded.

The instrument comprises four main components—measuring unit, amplifier, indicator and recorder. In the first unit, the sampling chamber, a light source and optical system provide a uniform beam of light which is projected across the cylindrical glass viewing chamber to three photo-electric cells, a special light trap preventing secondary radiation. This unit operates on the "light-scattering" technique, so that the degree of light scatter increases in proportion to the density or dust particles in the gas passing through the chamber, and hence the light received by the p.e. cells diminishes. At minimum scatter, the amplifier fed by the p.e. cell output is adjusted to give a zero reading on the recorder. Any decrease in light received by the cells results in their taking greater current, which is recorded. Also provided is an indicator unit incorporating a 7 in. diameter flush-mounted instrument. An auxiliary pointer on the instrument may be set to a pre-determined reading, so that when the indicating pointer reaches this value a circuit is closed to operate an alarm.

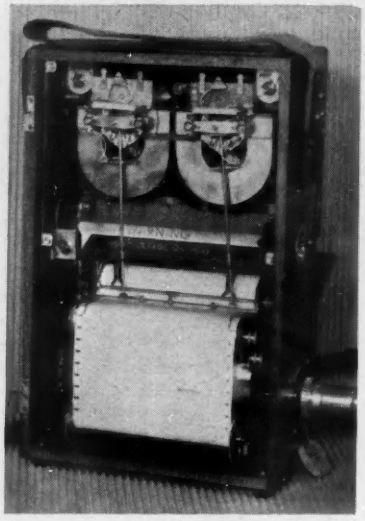
In use, blast furnace gas is taken from the main, raised above dew-point by preheating and passed through the viewing chamber, from which it is either injected back into the main, or exhausted to atmosphere. Smooth bends, gate-type valves and a thin-walled receiving tube ensure against aggregation of the particles. Measurement of the gas velocity in the main in conjunction with control of the flow rate in the sampling by-pass enables correct comparison reading to be made. Prolonged trials of the instrument under the guidance of the British Iron and Steel Research Association have given consistent results.



The Radiovisor dust monitoring equipment, the upper illustration showing the dust sampling chamber and photo-electric cell arrangement, with a 12 in. rule as a comparison for size

Quick-Response Recorders

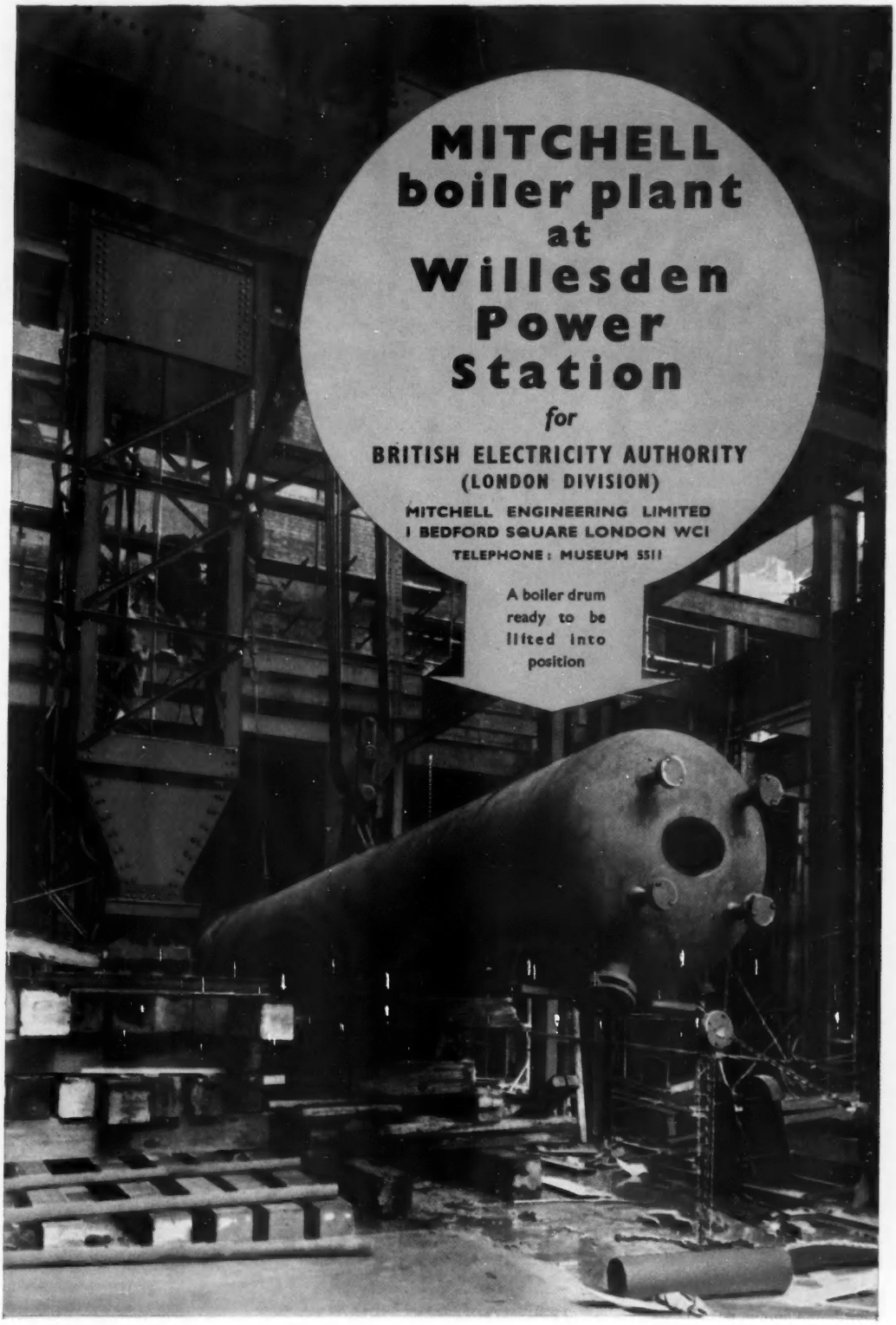
A RECORDING instrument which can record sine wave voltages of frequency up to 15 c/s with an amplitude error not greater than 15% has recently been marketed by EVERSHED AND VIGNOLES LTD., Acton Lane Works, Chiswick, W.4. Of the continuous chart type, two models are available, QU/RD15 and 15A, differing only in the chart speeds they provide. Each contains two movements which are essentially d.c. recording voltmeters having rapid response and negligible pen to paper friction. The maximum torque produced by the pen movement is 7 oz in. Servo-operated, the recorder works in conjunction with an amplifier unit to which it is connected by 5 ft of 18 core flexible cable.



The recording unit of Evershed and Vignoles' new high-speed recorder. A separate amplifier unit is also part of the complete equipment

The recorder unit itself is carried in a portable hardwood case measuring 18 in. by 11¼ in. by 7 in. An opening in the back facilitates chart replacement. Each of the two channels on the chart is 2⅞ in. wide, and, divided into ten large divisions subdivided by five small divisions, making allowance for the trace being a projection of the arc made by the tip of the pen area. Time lines are straight, being spaced at 4 in. intervals and a solenoid operated time marker is included. In operation the input to the recorder is opposed by a feed-back voltage derived from a resetting potentiometer controlled by the pen position. The error, being the difference between these two voltages, is amplified and made to vary the pen position until the feed-back voltage again balances the input. The pen zero may be set in any position.

Sensitivity may be varied to suit customers' requirements between the limits of ± 10 volts and ± 4 volts, for a maximum deflection of 1 7/16 in. each side of zero. An additional potentiometer control in the amplifier provides means to reduce the sensitivity to zero. The input impedance is approximately 50 kilohms with this control in circuit and 2 megohms with it switched out. As stated earlier, the instrument will record up to 15 c/s sine wave voltages with an amplitude error no greater than 15% for a peak to peak amplitude of 1½ in. At smaller amplitudes, the frequency response is proportionately higher. Linearity is stated to be within ±3%.

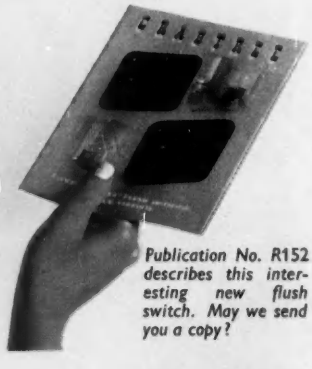

MITCHELL
boiler plant
at
Willesden
Power
Station
for
BRITISH ELECTRICITY AUTHORITY
(LONDON DIVISION)
MITCHELL ENGINEERING LIMITED
1 BEDFORD SQUARE LONDON WC1
TELEPHONE: MUSEUM 5511
A boiler drum ready to be lifted into position

The "Lincoln" Type AC –a *reliable* competitive switch

The "Lincoln Type AC flush switch is available in both single- and twin-switch patterns for erection in one gang plaster-depth boxes—a cost, time and space saving feature.

This new flush switch is sealed against dust and may be operated in silence, excellent contacting being ensured by silver-faced components. There is full, positive drive from the operating dolly. Switch and plate are one unit. This allows for self-adjustment to plaster variations without the need for adjustment devices. The "Lincoln" Type AC flush switch is so small that two switches can be provided on a single plate and there is ample cable space, even when the unit is mounted in a box of plaster-depth. It can also be erected in boxes to B.S. 1299. An interesting competitive switch from many points of view!

Description	List No.		Per Dozen	
	For Metal Boxes	For Hardwood Boxes	Brown	Cream
SINGLE SWITCH UNITS				
One Way Switch	2020	2020/1	35/-	39/-
Two Way Switch	2120	2120/1	44/-	48/-
TWIN SWITCH UNITS				
2 One Way Switches	2022	2022/1	65/-	71/-
1 One Way and 1 Two Way Switch	2021	2021/1	74/-	80/-
2 Two Way Switches	2122	2122/1	83/-	89/-



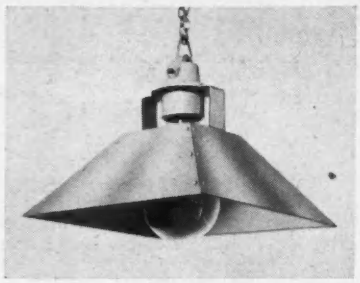
Publication No. R152 describes this interesting new flush switch. May we send you a copy?

CRABTREE

WIRING ACCESSORIES • SWITCHGEAR • MOTOR STARTERS

"Crabtree" (Registered)

C.679/214. Advt. of J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall, Staffs., England



Siemens produce Infra-red Heater

INFRA-RED heating for the rearing of young livestock is now accepted in farming circles and SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames St, E.C.4, have now produced their design of a fitting.

Simplicity and long life were features which Siemens aimed to achieve and the result certainly exemplifies these qualities. Yet the unit complete with 250 W infra-red lamps, porcelain lamp holder and metal link with adjustable suspension and a steel reflector is priced at 20s. 3d.

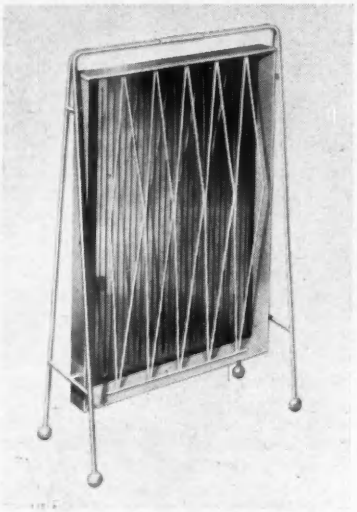
The reflector is designed to direct the infra-red rays over an easily defined area. Each lamp has a guaranteed life of over six months' continuous use. Installation costs are negligible because the heater may be operated directly from the normal electricity supply.

Safe Heat in Contemporary Style

IN production by PREMIER ELECTRIC HEATERS LTD., Keeley St, Birmingham 9, is a radiant screen heater which combines efficiency and safety in the contemporary style.

Rated at 1,000 W and listed at £9. 10s. plus £3. 9s. 5d. purchase tax, this heater employs an armour plate glass panel 25 in. by 18 in. wide on the back of which is incorporated a fully protected heating element operating at black heat so that the spread of heat over a large area eliminates the fierce beam of heat. Two amber pygmy lamps are fitted behind the glass plate at the base to give optical "warmth."

The frame is finished in stoved cream enamel standing 31 in. high by 20 in. wide whilst the removable tubular guard and the feet are in white. In summer the heater makes an attractive fire screen.



Contemporary, efficient and safe is this Premier heater

H.M.V. Price Decontrols

PRICES of certain discontinued lines have been decontrolled by H.M.V. HOUSEHOLD APPLIANCES, Hayes, Middx., in order to enable dealers to dispose of any nominal stocks they may still have.

These items are as follows: CP.1 Molton Coffee Percolator; CP.2 Claridge Coffee Percolator; KJ.3 Maddox Kettle; KJDL.3 Bentinck Kettle; Presentation case for Hair Dryer model HD.1; Presentation case for travelling iron IT.1.

Lincass Packaging restyled

ALL Lincass electric household appliances are now packed in attractive red and blue cartons of similar design,

Lincass Packaging is now uniform

say H. CASSIRER LTD., 31 Pinner Rd, Harrow, who point out the possibility of making an attractive display with these. The illustration shows the No. 951 kettle, the 654 coffee percolator and the 444/P automatic iron.

An Electrical Foundation Unit

A SIMPLE device yet one that is not normally freely available has been marketed as a standard line by the BUILD AIDS COMPANY, Machell Rd, Nunhead, S.E.15.

It is an adjustable electrical foundation unit for supporting electrical fittings when installed in houses or flats with plaster board ceilings.

Basically a piece of 3 by $\frac{4}{5}$ in. deal boarding with a central slot and two swivel end brackets the foundation unit is easily nailed between joists and the fitting is then screwed through the ceiling board on to the unit. It can be fixed between any pair of joists up to 18 in. between joists being inserted diagonally if distance between joists is smaller.

For the Electrical Trade

Stella TV Price reduced

THE price of the model ST 83170 television receiver has been reduced as from 27 Jan., say STELLA RADIO AND TELEVISION CO., LTD., Oxford House, 9-15 Oxford St, London, W.1.

New price is £58. 2s. 5d. plus £19. 11s. 7d. purchase tax, a total of 75 gns. This is a drop in total price of 5 gns.

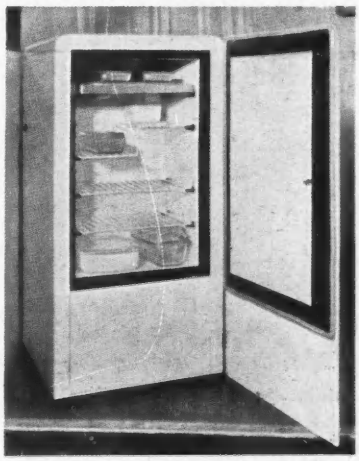
Cresta Refrigerators

TWO free standing models were recently added to the Cresta range of refrigerators made by INSULATIONS AND CONSTRUCTIONS LTD., St. John's Works, Penn, Bucks.

These are the 2 cu ft No. 200T model which is in white enamel (all metal) and is marketed at a price of £35. 10s. plus £14. 4s. purchase tax and a 4 cu ft metal model 400FS at £60 plus £24 purchase tax also in white enamel.

Both models are powered by the Cresta silent absorption unit. The first model is loaded at 100 W and the second at 150 W. They are guaranteed for five years.

The 2 cu ft model is equipped with a tray for making 12 cubes of ice whilst the larger model has a meat keeper, salad crisper, interior lighting, an egg shelf and two ice trays for making 24 cubes.



The 4 cu ft "Cresta" is a newcomer

PROBLEMS AND PRACTICE

In Engineering

Faults in M.D.I.s

THE maximum demand indicators in mind are those embodied in (or attached to) the registers of power meters; they work on the Merz principle of resolving kWh (or kVARh or kVAh, as the case may be) over set periods of time into average kW (or kVAR or kVA). The "trouble-shooter" who must attend to them is faced with a great variety of complaint possibilities.

As to internal failings: coils or resistors may open-circuit, or "short," or burn-out—or even may not suit the ruling voltage; the mechanism may suffer from the troubles of meter registers, or the m.d.i. may be affected by a fault in the associated meter; low readings may be caused by the "dog" (which pushes the free pointer up during averaging periods) not detaching at once when it returns at each period end; the pointer may also read low owing to an over-tensioned pull-back spring on the dog mechanism, or it may fall back because of vibration from outside or vibration inside; at resetting the pointer, too, may suffer from a false zero—as can the dog, and incomplete resetting by hand may occur; and the resetter poles can become skewed, or hold on the armature through wear of the anti-residual magnetism stop.

Abnormal readings can be caused by external faults. Auxiliary auto-resetting supply or control can be affected by failure in wiring, fusible cut-out or time-switch—or even by switching operations. The external device for hand-resetting the pointer may be out of order: it may not effectively reach the pointer, or it may actually allow interference with the pointer even though sealed; and loose or damaged parts in a resetter have been known to foul the disc-system or reach the internal terminals.

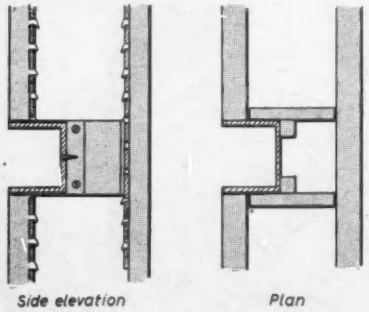
But an m.d.i. may be blamed wrongly, especially by the power consumer. The m.d.i. will respond to an otherwise unnoticed overload, and it is well worth while explaining to a consumer that if it goes up seriously there will be a serious cause such as plant fault, carelessness in utilising works machinery, running debarred plant, etc. Starting-up of plant after a long rest or after a supply failure must particularly put one on guard. Weather conditions can cause abnormal load effects. Misconceptions in load measurement arise when the load is intermittent and has a running period; shorter than the m.d.i.'s averaging period or when the *main* load of the day lasts less than an averaging period and does not always occur at the same relative time (e.g. a 20-minute load may be picked-up by a 30-minute m.d.i. as, to give extremes, a 10-minute load or a 20-minute load).—*G. E. M.*

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Flush Switch Fixing

WITH reference to the suggested methods of fixing flush switches by Messrs Satchwill and M. N., I feel that the system employed by the writer can offer advantages, in-so-far as a solid fixture is provided without any visible trace; this being especially important where wood panelling, distempered walls or new wallpaper are the surfaces upon which the switches are to be flushed.

First a hole is cut in the wall to the exact dimensions of the wood or steel switch-box. Then the depth of the wallspace is measured allowing for plaster overlaps if any; two pieces of 1 in. thick wood are cut to the wallspace diameter and of a length equal to the switch-box side. Next the depth of the plaster or boarding is measured and marked upon the side of the switch-box, this depth line is laid against the vertical side of each switch-block and the external edge of the back of the switch-box is marked upon the face of each block.



The method, using wood supports, of fixing flush switch boxes without making external holes

Upon the face of each block is now screwed a 1 in. square section wood step with its longest edge lying along the switch-box line. The two blocks are then placed at either side of the switch-box, with all edges level and the fixing holes of the box are pierced right through the wood steps. To fit the supports, a thin cord is looped through the brogued holes of each block, the blocks are then inserted separately through the holes in the wall and wedged into the wallspace at either side of the hole with the box fixing holes lined up on the centre line. The cords are removed, the box is placed in against the steps and screwed into position, the completed job being secure against any movement if all measurements and fittings have been accurately made. With this method, no external fixing holes are required and there is little possible chance of damaging the farside wall so that clients need have no fear of cracks appearing from holes, etc. The accompanying sketch shows the layout design.—*J. R.*

(This correspondence is now closed.—Ed.)

Magnetic Brake Trouble

I WOULD like to comment upon one or two points in Mr Byrne's notes of 21 Jan., relating an experience of brake coil failure which, alas, is all too common. With this type of electro-mechanical brake, it is unusual for the three brake coils to burn out simultaneously from age, or failure brought about by vibration. A complete burn out of severe over-heating points immediately to a faulty magnetic circuit through some mechanical restriction, or worn and damaged magnet faces, and a noisy hum or chatter usually accompanies this condition giving a clear warning, whether from brake or contactor, to examine the mechanical linkages, magnet faces or perhaps pole shading device.

Too often after a report of brake slip is the adjustment nut at the top of the shoes given a turn or so without any further re-adjustment to the bottom of each shoe to equalise the action, and of course a fitter will rarely think of the actual solenoid stroke length, or any restriction he has placed upon it, with the result of uneven wear of brake linings and, as in Mr Byrne's case, worse, a burnt out brake coil.

In one large factory it became a rule that all electro-mechanical brake adjustments should be carried out by the electrical staff who would then be responsible for the brake action not impeding the correct solenoid stroke. The action of a overhead crane hoist brake can be most critical, especially in foundries or particularly where the allowable overrun after the operation of a limit switch is small, and this again is another good reason why the electrical staff should be responsible for the brake setting, as in such cases brake and limit switch settings may be inter-dependent. In this connection it is good policy to issue crane drivers with instructions to test each limit switch (at a controlled speed) at the start of their turn of duty as any failure to operate can be reported then and not discovered after a mishap.—*T. H. Snelson.*

NEWS OF THE WEEK

B.E.A meets Cold Spell Demand

Monday Peak of 15,700,000 kW sets New Record

ALTHOUGH the recent cold spell has not been welcomed by the general populace of this island, it has served to place a distinguished feather in the cap of the B.E.A. Automatically the demand for electricity has risen considerably but (to date at least) there have been no power cuts due to power stations failing to meet the load, although on one occasion particularly it was a very close call. That particular time was early last Monday week (25 January) when power stations carried a load of 15·7 MW, the heaviest demand which the Authority has been called upon to meet yet. It was achieved with a "certain amount of voltage reduction," as Sir Henry Self explained at the conference of Housecraft Advisers. Sir Henry reminded the conference that last year's maximum load hardly exceeded 14 MW. Throughout the remainder of last week, the 15·7 figure was not reached again, we understand.

At the time of going to press actual figures for the whole of last week were not available. The Authority is quite confident, however, that they can continue to meet any similar demands. Only if weather conditions deteriorate to the extent that fuel supplies to power stations are held up will there be any likelihood of failure. One factor which has been of help during the cold spell was the comparatively bright days. Dark and overcast days might add difficulties. Breakdowns have been numerous, but difficult to attribute to icing or similar causes. The north-west coastal area had its full quota of failures during the gales of the weekend before last. The overall picture is certainly one of great progress since the (literally) dark days of 1946-47.

Industrial Exhibitions in Birmingham

THE staging of specialised industrial exhibitions in showrooms set aside for that particular purpose by the Midlands Electricity Board in Chester St, Birmingham, has proved to be a remarkably successful venture. On evidence there is little doubt about the popularity of these small displays. At the present time two further exhibitions are being planned. Opening on 15 Feb. there will be a comprehensive exhibition on the "Applications of U.V. Lighting." This closes on 26 Feb., and between 22 Mar. and 2 Apr. the subject will be "Refrigeration."

CIVIL DEFENCE BILL

INTRODUCED to the House of Commons and printed last week was the Minister of Fuel and Power's Civil Defence (Electricity Undertakings) Bill. This will enable the Minister to make grants in respect of capital expenditure on measures deemed necessary to protect the functioning of electricity undertakings in the event of war. It is estimated that during 1954-55 grants will amount to about £1,200,000.

This impressive photograph of Battersea power station set against the background of the evening sky depicts the slight change which occurred in London's skyline. The change has been brought about by the completion recently of the station's fourth stack, just over 300 ft high

£50,000 worth Japanese Lamps and Fittings to be allowed into U.K.

A GREAT deal of publicity has been given to the Sterling Payments Agreement signed last week with Japan. Most of what has been written, however, concerned cotton goods and clothing, but the agreement will also affect the electrical industry. The Government has fixed quotas for certain traditional imports from Japan which have not been admitted since the war. Annual quota in respect of handlamps and torches, etc., will be £25,000; for lamp bulbs (12 V or less) £15,000; and for filament or discharge (including fluorescent lamps) above 12 V, £10,000.

Main purpose of the Agreement is to enable Japan to maintain her purchases from the Sterling area, particularly in view of her expected shortage of sterling during 1954. The Board of Trade are inviting applications for licences and these should be made on Form IL B/A and returned by 22 Feb. Traders should receive Notice to Importers 630 giving details of the goods involved and method of application today, Thursday.

TRADE MARKS ACT

THE new Act strengthening the law relating to Merchandise Marks and increasing the penalties for offences came into operation last Monday. Under the Merchandise Marks Acts, 1887 to 1953, it is an offence to apply a false or misleading trade description to goods or to sell them. Trade description of articles covers a number of factors. It concerns the number, quantity, measure, gauge, or weight of the item, the standard of quality, or the suitability, strength, performance and behaviour of the goods. Descriptions may concern the place or country of manufacture, method of manufacture, or materials used in making the commodity. In addition, of course, it is an offence to infringe existing patents, privileges and copyrights.

Special Conference for Small Firms

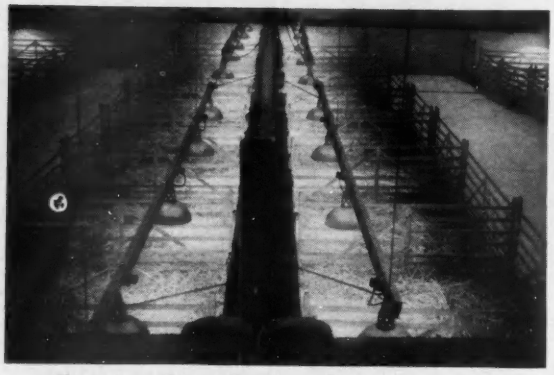
A SECOND conference for small firms is being arranged by the British Institute of Management. It is entitled "Managing the Small Firm" and will take place at Ashorne Hill, near Leamington Spa, between 5 and 7 Mar. It may be remembered that a conference of a similar nature took place last year, and its success was largely responsible for the present repetition. The programme covers a wide range of subjects, including finance, standardised costing work study, export marketing and organisational problems caused by expansion. All talks will of course be directed particularly towards the small business. It is requested that early application be made to the Institute's conference secretary. Conference fee is £4. 4s.

FARMERS ASKED TO USE MORE ELECTRICITY

FOLLOWING the announcement made by the Minister of Fuel and Power last June nearly all Electricity Boards are visualising and planning a much accelerated rate of progress in rural electrification and development. Already indications are that there has been a substantially increased rate of farm connections, and during the past two months or so, a number of Boards have announced their plans for the coming year. Only last week we reported that the Midlands Board expects to spend some £750,000 on rural electrification in the current year, and to connect about 1,000 farms. This and other schemes result directly from the increased allocation of £1½ million announced by the Minister.

Latest Board to submit their proposals to the Area Consultative Council is the S. Wales Board. It is considered that S. Wales can be fully developed in 15 years and plans which are or have been before the Council to date cover about a third of that programme. The Board has pointed out that such a programme requires the fullest co-operation from farmers and landowners. In the first place the Board must have the necessary facilities for the erection of o.h. lines, but also the new service must be used to the fullest extent possible. A large proportion of farmers, already connected, use the supply very meagrely, in 40% of cases, farmers use less than £10 worth of electricity in a year. Only by greater use of electricity and better co-operation can the economic aspect of the development programme be improved.

Coincidental with the Board's request, however, comes a protest from the Glamorgan branch of the National Farmers' Union. Expressing concern at the progress of rural electrification, a motion states that development has been impeded because of insistence on 100% acceptance of terms quoted in local development schemes. This was passed unanimously at the Union's meeting in London last week. It was maintained that capital contributions, either by lump-sum payments or annual payments, should be abolished.



Some of the pig pens and infra-red lamps at the Belfast sales yards of R. J. Allan Ltd.

Infra-Red Heating in Belfast Sales Yards

A MARKED increase in pig-turnover at the Belfast salesyards of R. J. Allan Ltd. necessitated extension of the market area devoted to the selling of these animals. Coincidentally this expansion called for better artificial heating in the high-roofed and draughty building, particularly for the comfort and well-being of sows and litters. It was finally decided therefore to install infra-red pig farrowing units made by Philips Electrical Ltd. The installation comprises thirty-seven 230 V 250 W infra-red lamps and was carried out by John Dowling and Sons Ltd. We note that the lamps can easily be lifted out of their normal working condition when not in use. This should be of help, especially in the market, as it will enable more freedom of movement about the pens for cleaning and other purposes.

City-by-City Strike Action moves to Merseyside

THE conflict between the National Federated Electrical Association and the Electrical Trades Union concerning the latter's claim for increased wages for employees in the contracting industry, looked no nearer settlement early this week. On Monday the union called out on strike men working in the Merseyside area, and Mr F. Foulkes, president of the E.T.U. has said that there will be a similar strike in the Manchester region next week and probably at Birmingham the following week.

The suggestion made in a section of the lay press last week that the Association were considering offering a wage increase was immediately refuted by the N.F.E.A. Certainly both parties involved are adamant in their attitudes. The Association suggests that the matter should be submitted to arbitration or an independent person, while the union opposes arbitration, maintaining that the industry's normal negotiating machinery should be utilised. On Thursday last the N.F.E.A. distributed leaflets to member firms setting out their arguments in favour of arbitration. These leaflets state that the Association offered arbitration on seven separate occasions, that an independent court of inquiry recommended that course, and that the conciliation officers of the Ministry of Labour have urged it on the Union.

In this week's strike of employees in the Merseyside, Cheshire and North Wales region, some 65 sites are affected, involving about 1,500 men.

OFFICIAL PUBLICATIONS

CIVIL DEFENCE (ELECTRICITY UNDERTAKINGS) BILL.—House of Commons Bill 58 (see page 183). H.M.S.O. 3d.

I.E.E. WIRING REGULATIONS.—1954 Supplement to 12th edition; and 1954 Supplement to abridged edition. Price 6d. each. Also,

RECOMMENDED PRACTICE FOR CARAVAN INSTALLATIONS.—Price 1s. All available from I.E.E., Savoy Place, W.C.2 (see page 164).

MINES. Report of H.M. Inspectors for 1952.—S.W. Div. H.M.S.O., 1s. 3d.

MINES AND QUARRIES. S.I.84: Metalliferous Mines (Amendment) General Regulations, 1954; S.I.85: Metalliferous Mines and Quarries (Electricity Exemption) (Revocation) Order, 1954; S.I.86. Quarries (Electricity) (Amendment) General Regulations, 1954; M.F.P. Safety Circular 208 on above (see page 185). H.M.S.O., 2d. each.

BRITISH STANDARDS. — B.S. 2065: Glossary of terms for characteristics of radio receivers; B.S. 1193: Sizes of sensitised material for recording instruments.

TUNGSTEN ORE PRICES

ONCE again the Ministry of Materials has announced a reduction in the prices of tungsten ores. As from last Thursday, the selling price for ores of standard 65% grade and ordinary quality has been reduced from 165s. to 145s. per long ton delivered consumers' works as regards Wolframite, and by 10s. to 140s. as regards Scheelite. These prices have been falling steadily over the past few months. In exactly three months the price of Wolframite has dropped by £6. 5s. and Scheelite by £5. 15s. On 28 Oct. the prices were 270s. and 255s. per long ton respectively.

DISCOUNT FOR PROMPT PAYMENTS URGED

A RENEWAL of the former practice of allowing discounts to consumers who paid electricity bills promptly was suggested at a recent meeting of the S.W. Electricity Consultative Council. It was also proposed that the Board be asked to ensure that final reminders for payment should not be issued earlier than 28 days after the dispatch of the first bill. The Board has pointed out that it dealt with 500,000 customers and had to impose some rule, which was that reminders be issued between 21 and 28 days after the first bill had been sent. Fewer reminders were being sent at the present time. It was decided to refer the matter to the tariff standing committee for full discussion and report.

E.A.W. AWARDS

WE noted last week the award of the Elizabeth Sloan Chesser Cup for the highest number of marks in 1953 in the E.A.W. Diploma in Electrical Housecraft. At the same time the Association announced the award of two other annual prizes. The Cllr. Miss Walter Rosebowl, presented to the students at the school gaining the highest average marks in the Home Workers' Examination, has been won by the County Technical School for Girls at Tonbridge. This is the second successive year that this school has won the trophy, and an added coincidence is the fact that the runners-up, the S.E. Essex Technical School at Dagenham, also finished in the same position last year. The annual monetary awards given to housewives with the highest marks in the same examination was divided between three persons who tied for first place. The money is provided by the E.A.W.'s Cheltenham branch to commemorate their silver jubilee.

The First Half-Century

Having regard to the importance to business men of having a standard time in London and other large cities and in large works, it is to some extent remarkable that more has not been done towards providing such services. True there is the arrangement whereby certain public clocks are corrected to Greenwich time, and in a number of large works, railway stations and similar places, electrically synchronised clocks are installed; but an extended use of synchronised time services is yet to come. Our attention has been drawn to the matter by a pamphlet on electric time service. Mr F. Hope-Jones, proprietor of the pamphlet's sponsors, has done much towards the introduction of electric time services. In 1899 he introduced the subject to the I.E.E. and has continued to advocate the interests of the electric clock. He had an excellent exhibit and secured a silver medal at the International Fire Exhibition last year.—*From our issue of 4 Feb., 1904.*

Sir Henry Self, dep. chairman (administration) of the B.E.A. delivering the opening address at last week's Electrical Housecraft Advisers Conference. With him on the platform were Dame Caroline Haslett and Col. B. H. Leeson. The conference was organised jointly by the E.D.A. and E.A.W.

Economy in Use of Power in Schools

ECONOMY in the use of electricity in schools is the substance of a recommendation made by the Swansea Education Finance sub-committee. It was put forward to the full education committee after consultation with the S. Wales Electricity Board. It is urged that head teachers should be asked to ensure that the utmost economy is effected. Other recommendations made at the same time were that the borough council's representatives on the Area's Consultative Council should press for a more suitable tariff for supplies to schools, and that further consideration should be given to the installation of fluorescent lighting in new schools. We understand that the question of charges to schools was raised at a previous meeting when attention was drawn to the cost of power at the grammar school. The recommendation was adopted without discussion.

The first two Area contests in E.D.A.'s Public Speaking Competition took place in London recently. In the all-London men's contest, Mr B. D. Lawlor of the Board's H.Q. gained first place, and in the joint London S.E. and Southern areas competition for women, the distinction went to Miss Ruth Ward, of the Sutton showrooms. Both go forward to the national final to be held on 23 April

Appeal to abolish P.T. on Water Heaters

AT their meeting in Manchester last week the N. Western Electricity Consultative Council passed a resolution seeking the abolition of purchase tax on water heaters. Thus this Council add their support to the same request made a short time ago by their neighbours in the Merseyside and N. Wales Area. Tax on water heaters at present stands at 50%. One of the main arguments put forward in support of the request concerns the modernisation of old houses, now being urged by the Government. A primary consideration in such conversions is the provision of a hot water supply, but the tax on water heaters, it is urged, prevents a service being installed in many houses.

Electricity in Mines and Quarries

TERMINATION of permission to use pre-1938 standard apparatus is the effect of two Statutory Instruments which come into operation on Sunday, 7 Feb. They are S.I. 1954 Nos. 84 and 86, entitled respectively The Metalliferous Mines (Amendment) General Regulations 1954 and the Quarries (Electricity) (Amendment) General Regulations, 1954. Both sets of regulations fix 1 Sept. 1955 as the date by which certain cables and other electrical apparatus installed at metalliferous mines and quarries must comply with the requirements of the appropriate parent regulations. The cables and apparatus concerned were in use before 1 July, 1938, and they complied with the regulations then in force. Hitherto they have all been exempted from the requirements of the 1938 regulations.

Club's First Guest Speaker

AS previously announced monthly luncheons of the Electrical Industries Club will take place on the second Tuesday. For the first luncheon on 9 Feb., Sir Norman Kipping, J.P., director-general of the F.B.I., will be the guest speaker.

Bumper Year for Radio and Television Sales

AS anticipated, last year was a bumper one for the sale of radio and television sets. Figures published last week by the R.T.R.A. for December complete the picture of 1953. Sales of radio sets were the highest recorded for any month since April 1951. Television sales showed a slight decline over November, but nevertheless were the highest for December. The Association's figures for the average number of radio sets sold per shop during the month under review were 14·31, compared with 10·07 in the preceding month and 10·24 in December 1952. As regards the sale of TV sets, the December figure was 15·73, just 0·27 lower than November and comparing with 15·35 in the corresponding month of the previous year.

A large proportion of the increased sales during 1953 compared with 1952, can, of course, be attributed to the Coronation in June. This was particularly the case with television, for instead of the more usual three or four sets per shop average, in April an average of 10·22 sets were sold, and in May an average of 18·74. In June itself the figure more than doubled that of 1952. Since March monthly sales have always been greater than those of 1952 and during the whole year an average of 134·39 sets were sold compared with 112·45 in the previous year. Radio sales followed a similar trend although they were not so marked. During the whole year an average of 98·48 sets were sold per shop compared with 82·14 in 1952.

COUNCIL AGREEMENT ON TENANTS' APPLIANCES

WE hear that Manchester city council has made some concessions following an electricity consumer's representations that municipal tenants had no freedom of choice in the type of cooker and wash-boiler installed. The Area Consultative Council has been informed that tenants will be allowed to use their own appliances when moving into new houses. Where washing machines are installed, electric wash-boilers will be removed and refixed in another house.

In cases where the tenant is allowed to provide either a cooker or a wash-boiler he will be responsible for maintenance. A third factor in the agreement concerns the tenant's desire to have a better cooker than that provided by the Council. In such a case the tenant will be allowed to pay the difference and have the improved type, but the cooker would become Corporation property.

Over-Anxious Builder was Fined 5s.

"WE do not think it a very serious offence," said the chairman of the Bench at Yeovil Court recently when he fined a builder 5s. with £1. 15s. costs for fraudulently using electricity at work. It was stated that two meter men saw a light burning in an unoccupied house and found the builder working there. The meter had been disconnected, and consequently it was alleged that power was being obtained illegally. In a statement, the defendant said he had a job to finish before leaving so he hooked up two loose ends of wire where the meter was formerly fixed. He only used a 75 W lamp for about half an hour, he claimed. In his defence it was said it was just a case of being over-anxious to get the job finished.

Fifty Teams enter Young Farmers' Contest

OVER 50 teams from Young Farmers' Clubs have so far entered for the novel electrical competition inaugurated by the S. Western Electricity Board two months ago. The object of this contest, as reported in our 3 Dec. issue, is to familiarise farmers of the future with the economics of electricity on the farm. Teams taking part will have to carry out an extensive investigation into the ways of installing electricity on an imaginery farm so as to ensure the fullest economy and efficiency. In the course of their inquiries the contestants will have to study electrical methods in agriculture and ways of reducing labour and fuel costs. About 160 clubs in the Area are eligible.

Question papers are now being distributed to clubs taking part. We note that the closing date for entries was extended to 3 Feb. to make allowances for the intervening Christmas holidays.

NEWS IN BRIEF

First apprentices Presentation Day held by Marconi's Wireless Telegraph Co., Ltd. at their Chelmsford works took place recently. Eighty-one apprentices were presented with monetary awards.

Royal Society of Arts has announced offers of endowed prizes to be awarded during 1954.

Series of monthly demonstrations of resistance welding are to be given by Meritus (Barnet) Ltd., at the works in Wood St. The first will be on 13 Mar.

Fourth International Conference on Electrodeposition and Metal Finishing will be held in London between 20-24 April under the auspices of the International Council for Electrodeposition.

Mr Philip Harben's next cookery demonstration for an Electricity Board will be at Hornsey Town Hall, London, N.W.8, on 24 Feb., and sponsored by the Eastern Board.

S.E. Scotland Electricity Board has opened a new showroom at 88 Walter Scott Ave, The Inch, Edinburgh.

A total of 100,000 families in Cornwall now have a supply of electricity. In a ceremony on the Illogan estate, Mr H. Midgley, deputy chairman of the S. Western E. Bd., presented a vacuum cleaner to the 100,000th family.

Electronics Course at Harwell in April

PHYSICISTS and electronic engineers holding degrees or the equivalent, are being invited to attend the eighth specialised course on design, use and maintenance of electronic instruments used in nuclear physics, radiochemistry and work with radioisotopes. The course is organised by the Atomic Energy Research Establishment at the Isotope School at Harwell, and will take place between 5 and 9 Apr. The course will include lectures and practical work concerned with counters, d.c. and pulse amplifiers, coincidence units, scalers and ratemeters. It is limited to 12 persons and fee is £12. 12s. Applications should be addressed to the Electronics Div., A.E.R.E., Harwell.

A second Radioisotope Conference is to be held in Oxford between 19 and 23 July. Final programme will be available next month. Applications to the conference secretary by 28 Feb.

Engineering in the R.N.

PRINCIPAL speaker at the first of the Batti-Wallah's luncheons in 1954 was Vice-Admiral (E) F. T. Mason, who gave the members and guests a necessarily brief review of engineering developments in the Fleet. Although the gas turbine had appeared on the scene, it seemed that steam would continue to be used for some time yet. The tendency at the moment was toward higher temperatures and pressures with increasing outputs.

During the war, hundreds of different types of diesels had been introduced; these had now been reduced to about 20. A remarkable prime mover was the Deltic, which, weighing less than 50 tons, could develop some 2,500 h.p. Gas turbines were scarcely far enough out of the experimental stage for major power units but were being used for boost.

Sayings OF THE WEEK

"During the last 12 months, the increase in the use of electricity in the South-West has been greater than in any other area in the country," . . . MR S. F. STEWARD, chairman of the South-Western Electricity Board, speaking at the dinner dance of the Bristol branch of the E.C.A.

"I am pleased to report that the general health of this association is excellent," . . . MR S. L. M. BARLOW, president of the Electrical Contractors Association and the allied associations, at their annual dinner.

"Country life was threatened by many things, including new schemes to provide electricity or gas or new reservoirs, which all encroached on the greatest of all human needs, the living together in the social life of the country," . . . THE ARCHBISHOP OF CANTERBURY at the annual dinner of the National Farmers' Union.

ELECTRIC SUPPLY NEWS

Billingham-on-Tees

THE Urban Council has asked the North-Eastern Electricity Board to place underground certain cables for supplying electricity to houses. The Council referred to a recent fatal accident due to overhead lines coming down, and in reply, the Electricity Board pointed out that while it would be rash to give a completely unqualified assurance that no accidents could happen, the lines in question were constructed in accordance with regulations and fitted with highly efficient protective gear to reduce risk to an absolute minimum. The Board stated that to lay the lines underground would cost £9,555 or about £12 to £13 per house. The Council is still in touch with the Board on the subject.

Eston (Yorks)

THE Urban Council has approved proposals by the North-Eastern Electricity Board for the laying of underground cables to serve the Redcar Rd East housing estate, South Bank, and the Crossbeck housing estate, Normanby.

Gloucestershire

AN alternative route, along the Severn Valley, was suggested by Mr D. G. Rogers, deputy clerk, to the Gloucestershire County Council, at the public inquiry held last week into the proposal of the B.E.A. to erect a 275 kV transmission line from Hams Hall to Melksham. He submitted that against a background of a project costing £2,700,000 the additional cost of £250,000 for an alternative route was not such a ridiculous sum that it could not be considered. Mr Rogers said that there was no wish to oppose the project as such, but when the countryside under consideration was the Cotswolds it was more important than ever necessary that the route should be carefully considered.

Letters were read from the Warwickshire and Worcestershire Branches of the County Landowners Association expressing the hope that everything possible would be done to preserve amenities. Objection to the scheme on amenity grounds was made in a letter from Worcestershire County Council also speaking for the Evesham and Perthshire Rural Councils.

For the B.E.A., Mr G. Thesiger, Q.C., said that apart from the cost of a longer route, a certain amount of energy was lost and agreed that a number of individuals would be disturbed. The proposal was to link the Birmingham circuit with the South West of England and South Wales and on to London and the Authority wanted the Melksham section to be completed by 1956. Saying that it was the section from Cheltenham to Cirencester to which objection was made he stated that if the line suggested by the Gloucestershire County Council had been deliberately plotted from an amenity angle it provided more, or certainly as much, ground for objection as the other line. "Is it expedient," he asked, "to go 56 miles by the Severn Valley, compared with 46 miles by Cheltenham to avoid that stretch over a part of the Cotswolds?" The alternative line also covered a part of the Cotswolds.

Major Nelson Rooke, agent, made objections to the Severn Valley alternative on behalf of the Duke of Beaufort, whose estates comprise about 16,000 acres centred on Badminton. The proposal would mean a concentration of three high voltage power lines on a most important part of the estate. It would involve 52 towers within an area 2 miles by 3½. Others, including the Gloucestershire R.D.C. opposed the alternative Severn Valley route, but the Gloucestershire branch of the C.P.R.E. thought a pylon line would be absorbed comparatively easily by the larger-scale scenery of the Severn Valley, part of which had already been heavily industrialised. The inquiry ended on Friday and the chairman, Mr H. W. Grimmitt, chief engineering inspector to the Ministry of Fuel and Power, said that the Minister's decision would be announced.

Northern Ireland

DURING this year, the Electricity Board for Northern Ireland expected to connect between 1,000 and 1,200 farms and from 3,500 to 4,000 other rural dwellings, the Minister of Commerce, Lord Glentoran, has stated in Stormont. The Minister said that in the five years, 1949 to 1953, the following numbers of farms had been connected to the Board's system—611, 845, 1,483, 1,328 and 1,431. During the same years the following number of other rural dwellings had been connected: 4,684, 3,654, 4,163, 3,826 and 3,543.

LIGHTING SCHEMES

Bentley (Yorks). The U.D.C. is to proceed as soon as possible with a £9,000 scheme for sodium lighting of two miles of the Great North Rd.

Blackburn. T.C. is recommended to approve the conversion of a portion of the street lighting in the borough at a cost of £25,000.

Enfield. The Council have applied to the M.o.T. for consent to improve street lighting in the borough at a cost of £11,000.

Exeter. The T.C. is seeking to borrow £12,878 for carrying out a scheme for the remainder of the main street lighting.

Sunningdale. The parish council has approved the second stage of a scheme for the conversion of street lighting from gas to electricity, to cost £1,152.

QUESTIONS IN PARLIAMENT

Census of Production

THE Association of British Chambers of Commerce's query as to the usefulness of the censuses of production was echoed by Sir Waldron Smithers in the House last week. Mr P. Thorneycroft said the annual cost of the census was about £175,000. The cost of the first taken in 1949 would be some £710,000. He said it was important that the cost of the work should be justified by the benefit derived, and to discover this, a committee had been appointed to advise on future policy.

The committee was appointed about last March and is under the chairmanship of Sir Reginald Verdon Smith. It is examining *inter alia* the uses to which the censuses are put and have invited a number of trade organisations to express their opinions.

Changes in Purchase Tax

SIR WALDRON SMITHERS asked if the Chancellor had consulted any organisations before making the recent purchase tax reductions. Mr J. A. Boyd-Carpenter said that for obvious reasons non-official bodies were not and could not be consulted, but representations by trade and other organisations were considered.

Increased Exports

IT will be recalled that just before Christmas, the Minister of State, Board of Trade, despatched some 50,000 letters to manufacturers reminding them of the importance of exporting and giving some of the ways in which the B.o.T. could help. Both Mr G. S. de Freitas and Wing Cdr E. E. Bullus asked what success this circularisation had achieved, and Mr P. Thorneycroft stated that about 19,000 replies had been received. Some were from firms whose goods would be unsuitable for export, but over a third sought further information about the services available to them, and these enquiries had been answered.

Rights of Entry

RIGHTS of Entry (Gas and Electricity Boards) Bill was considered in Committee; reported without Amendment; read the third time and passed on Friday.

Industrial Disputes

A question was asked last week by Mr H. Boardman on the recent Birmingham speech of Sir Godfrey Ince, permanent secretary at the Ministry of Labour. Replying on behalf of the Minister, Mr Watkinson agreed that the speech was made with the Minister's approval. He assured the House that it remained the Department's policy to encourage the voluntary acceptance of the principle of arbitration for settling industrial disputes, as also to allow the right of organised labour to strike.

New TV Stations

SCARCELY a week goes by without a flood of enquiries about the development programme in the field of television. Last week was no exception and as regards individual stations, Mr D. Gammans repeated his estimate that the new permanent transmitter for N. Ireland would be in operation in 1955, and the station at Aberdeen before the end of the same year. The temporary low-power station for Aberdeen would however be in service by the end of this year.

Capital cost of the 14 TV stations now being built would be about £2,300,000, said Mr Gammans, and the B.B.C.'s proposals for 56 V.H.F. sound broadcasting transmitters was estimated to cost £2 million. To other questions, Mr. Gammans said the six new TV stations would all operate on Band 1, between 41 and 68 Mc/s. Later he reminded the House that he had never disguised his opinion that there could never be a 100% television coverage.

Power Cuts

THE number of power cuts which have occurred in the years following 1950 as a result of the shortage of generating plant were given by Mr L. W. Joynson-Hicks in reply to Brig T. H. Clarke. In 1950 there were 85 cuts, in the following year there were 100, in 1952 the number was only 12, and no cuts were recorded last year.

Hessary Tor TV Station

THE promised decision of the Minister of Housing concerning the use of Hessary Tor as a television station was given in the House just after we went to press last week. Permission has been given for the station subject to certain safeguards.

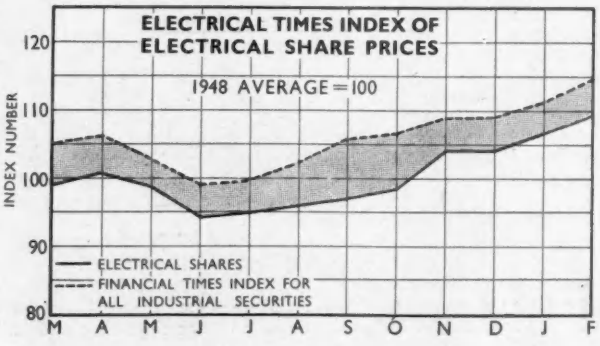
COMPANY ACTIVITIES

GREAT credit goes to Sir Edward Wilshaw, K.C.M.G., D.L., J.P., LL.D., F.C.I.S., once office boy and now Governor of Cable and Wireless (Holdings) Ltd. At the time when the company's Cable and Wireless holding was nationalised, and the board decided to become an investment trust, there was tremendous opposition by a section of the shareholders, the result of which was a scheme giving them alternatives. How those who took cash have fared is not our business. They may have done worse, they may have done better, but those who stood by Sir Edward are doing better every year.

In the old days, when Cable and Wireless was a tele-communications concern, the dividend was usually 4%. After four years as a mixed investment trust, dividend has gone up to 9%. For the past year, revenue, before loan stock interest and taxation, went up from £916,805 to £942,000 and the dividend from 8% to 9%. What cheered Sir Edward's supporters however, was the announcement of a one-for-ten scrip issue (subject to C.I.C. consent).

But even now, there are some who would like to see a little longer test of Sir Edward as an investment trust expert. It is pointed out that the past year was quite favourable to the trust movement. In other words, they are saying that almost any one could have invested last year and made money. But it is not quite so easy as that as any one knows who tries to do it as an individual.

The board, which is a model of conservatism, is evidently very satisfied with the turn of events, which is borne out by their decision both to increase the dividend and to propose a share bonus. The market and investors are quite satisfied, too, for since the announcement, the stock has risen £21½ to £170, at which it yields just over 5½%.—*From our City Correspondent.*



Share price indices soared again during January, both the general and particular figures rising over 3 points, the largest for many months. The "Financial Times" index for all industrial shares rose from 111·3 to 114·9, whilst the "Electrical Times" index for electrical shares rose by 3·3 to 109·6

Burgess Products Co.

The directors of this concern are seeking permission of the Capital Issues Committee to make an issue of fully paid up shares on a one-for-one basis.

Cable and Wireless (Holding) Ltd.

With a final dividend of 6% the total distribution for the year is again 9%. The group profit after providing for interest and taxation, is £317,000, compared with £319,605 for the previous year.

India Rubber, Gutta Percha and Telegraph Works Co.

The group profit for 1953 at £216,572 is nearly £140,000 lower than for the previous year, but the ordinary dividend is maintained at 9%. After charging taxation, etc., the net profit becomes £105,801, compared with £140,665 for the preceding period.

Lindley Thompson Transformer (Holdings) Ltd.

The improvement in the profit figures noted in our accompanying table are the result of a 30% increase in turnover which was achieved from a substantially higher production aided to some extent by easier availability of materials. According to Mr J. Lindley Thompson, the chairman, the prospects for the next financial year are not so easy to forecast. The fall in the price of a number of materials, the uncertain labour position resulting from the demands now being put forward, combined with the restricted purchase of the firm's type of goods by the Electricity Boards and other users, make it difficult to forecast accurately the trading possibilities. The current financial year has been commenced with an order book sufficient to maintain the present production level for about seven months. This, the directors consider, is satisfactory, in view of the present position. Export trade last year was approximately 18% of the firm's output, but this avenue of business is becoming more difficult and future orders may well be assumed to give little or no return, especially if labour costs are increased at this juncture, he adds.

Year to 30 Sept.	£ Trading Profit	£ Net Profit	% on Ord. Earned	Ord. Paid	Ord. Price High	Ord. Price Low
1952	66,165	22,677	16	12½	1/3	10d.
1953	87,660	37,014	26	12½	1/3	11d.

Dividends Declared

H. J. Baldwin and Co. Interim of 10% (same).

Electrical Components Ltd. Interim of 7½% (same).

Morgan Crucible Co. Interim of 3½% (same).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders, unless otherwise stated.

5 Feb.—Southport T.C. Installation in chemistry laboratory at King George V school.—See 21 Jan. issue.

5 Feb.—Tranent T.C. Sodium street lighting for trunk road A.1.—See 28 Jan. issue.

6 Feb.—Banbridge (N. Ireland) R.D.C. Wiring of 36 houses at Kinallen, Moneyslane and Shaneghan.—See 21 Jan. issue.

6 Feb.—Cheadle and Gatley U.D.C. Street lighting during 1954-55.—See 21 Jan. issue.

6 Feb.—Seaham U.D.C. Installation in 150 houses. Also supply of electric washboilers.—See 21 Jan. issue.

6 Feb.—Mitcham T.C. Lamps during 1954-55.—See 21 Jan. issue.

6 Feb.—N. Ireland. Lamps, cables, electrodes, etc., during 1954-55.—See 28 Jan. issue.

6 Feb.—Consett U.D.C. Lamps for street lighting during 1954-55.—See 14 Jan. issue.

6 Feb.—Solihull U.D.C. Fittings and lamps, etc., during year beginning 1 Apr. —See 14 Jan. issue.

6 Feb.—Swansea T.C. Public lighting supplies in year beginning 1 Apr.—See 14 Jan. issue.

6 Feb.—Stanley (Dur.) U.D.C. Electrical materials during 1954-55.—See 28 Jan. issue.

8 Feb.—Crayford (Kent) U.D.C. Electrical goods and boilers in year from 1 Apr. —See 21 Jan. issue.

8 Feb.—Coventry T.C. Electrical equipment during 1954-55.—Advertised in 28 Jan. issue.

8 Feb.—Haslingden T.C. Sodium street lighting in Group A along A.680 and A.681.—See 28 Jan. issue.

8 Feb.—Hetton U.D.C. Electrical equipment during 1954-55. Names by above date.—See 28 Jan. issue.

8 Feb.—Luton T.C. Installation in Whipperley school.—See 28 Jan. issue.

8 Feb.—Warrington T.C. Concrete lamp columns during 1954-55.—See 21 Jan. issue.

9 Feb.—Bath T.C. Supply during 1954-55 of lamps, cables, control gear, steel columns, lanterns, etc., for street lighting. —See 14 Jan. issue.

9 Feb.—Grimsby T.C. Installation in King Edward VI grammar school for girls. Names by above date.—See 28 Jan. issue.

9 Feb.—Stockport T.C. Supply and erection of 300 group A concrete street lighting columns and installation of lanterns and control gear; and supply of 300 lanterns, chokes, capacitors for 250 W mercury lighting. Borough Surveyor, Town Hall.

9 Feb.—Cannock U.D.C. Street lighting equipment and fittings in year beginning 1 Apr.—See 21 Jan. issue.

10 Feb.—Bath T.C. Electrical installation in 20 houses on Moorlands estate. City Architect, 7 North Parade Buildings. Deposit £1. 1s.

10 Feb.—Larbert. Electrical work Royal Scottish National Instn. Apply by above date to D. M. Johnston, secretary to Board of Management.

10 Feb.—Minehead U.D.C. Street lighting in Park St, the Parade and the Avenue.—See 14 Jan. issue.

11 Feb.—Metropolitan Water Bd. Lamps during year fiom 1 Apr.—See 21 Jan. issue.

12 Feb.—Belfast T.C. Heating installation at power station East.—Advertised in 14 Jan. issue.

12 Feb.—Macclesfield. Electric lamps and fittings to some or all hospitals during 1954-55.—See 28 Jan. issue.

12 Feb.—Heckmondwike U.D.C. Installation in 36 houses on Dale Lane estate. —See 28 Jan. issue.

13 Feb.—Altrincham T.C. Concrete lighting columns for year ending 31 Mar., 1955.—See 21 Jan. issue.

13 Feb.—Brentwood U.D.C. Electric lamps required in year ending 31 Mar, 1955. Engineer and Surveyor, Council Offices.

13 Feb.—Edinburgh T.C. Installation at Drylaw primary school.—See 28 Jan. issue.

13 Feb.—Huddersfield. Tungsten filament, mercury vapour and sodium lamps, cables, for year beginning 1 Apr.—See 21 Jan. issue.

13 Feb.—Manchester T.C. Annual maintenance of electrical equipment in schools and other premises.—See 28 Jan. issue.

13 Feb.—Stockport T.C. Lamps for schools for year ending 31 Mar., 1955.—See 21 Jan. issue.

15 Feb.—High Wycombe T.C. Street lighting along London-Fishguard trunk road (A.40).—Advertised in 28 Jan. issue.

15 Feb.—Northwich T.C. Electric lamps wanted during year beginning 1 Apr. H. C. Rowley, City Engineer, City Hall.

15 Feb.—Wallsend T.C. Installation of lighting and points in Central Schools, St. Peter's Rd. H. Wyndham Bodger, Borough Education Officer, Town Hall.

15 Feb.—Perthshire. Electrical installation in 90 houses on sites at Glencarse (10), Luncarty (10), Methven (10), Scone (24), Birnam (6), Murthly (8), Deanston (6), Killin (6), and Dunblane (10). Apply by above date to County Clerk, County Offices, Perth.

16 Feb.—Downpatrick (Down) R.D.C. Lighting installation in 12 houses at Ballysugagh. Munce and Kennedy, architects, 133 University St, Belfast. Deposit £3. 3s.

16 Feb.—Poole T.C. Wiring supplies and accessories, lamps, street lighting equipment.—See 28 Jan. issue.

17 Feb.—Sutherland. Electrical installation in Ross House Girls' Hostel, Dornoch. County Architect, E. W. Brannen, County Offices, Dornoch.

18 Feb.—Kidsgrove U.D.C. Supply of 10 concrete columns and 125 W mercury vapour discharge lamps, lanterns and accessories on Links Rd, Crown Bank and Ashenough estates. Engineer and Surveyor, Town Hall. Deposit £1. 1s.

18 Feb.—Kelso T.C. Installation of electricity in 82 prewar houses. W. C. Neil, Burgh Surveyor, Burgh Chambers.

20 Feb.—Macclesfield T.C. Supply and erection of 90 sodium units on concrete columns in group A along Park St, Park Lane, Congleton Rd, and Oxford Rd. J. H. Dossett, Borough Engineer, Town Hall, Deposit £2. 2s.—Advertised in this issue.

20 Feb.—Bournemouth T.C. Supply of 150 "Moseley" or similar street lighting columns; 150 swan-neck brackets; 150 hardwood boards; and 150 "Wembley Open" z.5045 or similar to take 60-200 W lamps. Borough Engineer, Town Hall.

20 Feb.—Higham Ferrers T.C. Street lighting in class B.—See 21 Jan. issue.

22 Feb. — Bedlingtonshire. — Electrical goods during 1954-55.—See 28 Jan. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 112 queries answered this week

"Monarch" fires, makers of? E.H.L.—Eveson Bros. (1928) Ltd., Monarch Works, Lye, Worcs.

Movable point overhead bus-bar systems suitable for 12 volt inspection lamps—for garage use, makers of? S.E.B.—Kelvin-Norton Electric Co., Ltd., 3 St. Martins Rd, S.W.9; Electro-Mechanical Supplies Ltd., 39 Queen's Rd, Coventry; Geo. W. King Ltd., Hitchin, Herts; Aircraft and Garage Equipment Ltd., 47 Granby St, Liverpool 18; Donovan Electrical Co., Ltd., 70/82 Granville St, Birmingham 1; Pruden and Pope, 38 Church Rd, S.E.19.

"Veret" bedwarmers, makers of? M.N.W.—Hall and Veret Ltd., 434 Rochester Way, Sidcup, Kent.

Electrically heated frying pans, makers of? E.E.L.—S. I. Engel, 23/25 Kensington Park Rd, W.11.

"S-on-A" kettles, makers of? W.A.H.—N. C. Joseph Ltd., The Aluminium Works, Stratford-on-Avon.

"Wavemaster" hairwaving machines, makers of? L.E.B.—Airmatic Ltd., 63 Frith St, W.1.

Rainville Eng. Co., Ltd., makers of f.h.p. motors, address of? T.E.—Mill Lane, Lymington, Hants.

22 Feb.—Yiewsley and W. Drayton U.D.C. Supply of 100 steel street lighting columns for class B scheme. Council's Engineer and Surveyor, Drayton Hall, West Drayton.

24 Feb.—Clutton (Bristol) R.D.C. Electrical installation in 20 houses at Publow. Thomas and Morgan and Partners, 23 Gelliwasted Rd, Pontypridd. Deposit £1. 1s.

25 Feb.—Dewsbury T.C. Supply of 1 Bijou mantles, 230 V and 240 V lamps, cable, 100-200 W open-refractor type lanterns, swan-neck brackets and spigots, swan-neck brackets with control gear, concrete lamps, etc. Street Lighting Engineer, 27 Battye St.—Advertised in this issue.

26 Feb.—Donegal. Electrical installation in proposed new county hospital at Letterkenny. J. A. Kenny and Partners, consulting engineers, 44 Kildare St, Dublin. Deposit £10. 10s.

27 Feb.—Aireborough U.D.C. Supply and erection of about 55 Class B mercury vapour and fluorescent units along 3 streets. Engineer and Surveyor, Council Offices, Micklefield Hse, Rawdon, Leeds. Deposit £2.—Advertised in this issue.

27 Feb.—Irlam U.D.C. Supply of lamps for year ending 31 Mar., 1955. Engineer and Surveyor, Council Offices.

1 Mar.—Birkenhead T.C. Equipment for Technical Colleges.—See 28 Jan. issue.

5 Mar.—Belfast T.C. Seven 220,000 lb/hr stoker fired boiler units and other plant for power station West.—Advertised in 31 Dec. issue.

5 Mar.—Belfast T.C. Feed heating and condensing plant sets; and piping, steam receivers and associated valves, electrical controls, fittings, etc.—Advertised in 7 Jan. issue.

5 Mar.—Wiltshire. Electrical installation in new divisional police headquarters at Salisbury. Applications by 12 Feb. to F. I. Bowden, county architect, County Hall, Trowbridge. Deposit £2. 2s.

8 Mar.—Oxfordshire. Electrical installation in secondary modern school at Banbury. Apply by 10 Feb. to County Architect, Park End St Offices, Oxford. —Advertised in this issue.

8 Mar.—Dublin. Wiring installation at Dr Steevens' Hospital. Delap and Waller, consulting engineers, 63 Lower Baggot St, Dublin. Deposit £6. 6s.

10 Mar.—Leeds. Electrical works at Hull Royal Infirmary. Applications by 6 Feb.—See 28 Jan. issue.

24 Mar.—Ilford T.C. Supply of vertical spindle pumps with motors and other equipment for sewage at pumping station in Roden St. Borough Engineer, Town Hall. Deposit £2. 2s.—Advertised in this issue.

26 Mar.—Belfast T.C. Two sets of central evaporating plant for power station West.—Advertised in 28 Jan. issue.

No date stated—Bristol. Electric lamps in 1954-55 for Hortham-Brentry Hospital Committee.—See 28 Jan. issue.

No date stated—N. of Scotland H.E. Board. Lighting and heating at Killin substation.—Advertised in 28 Jan. issue.

No date stated—N. of Scotland H.E. Board. Construction of 132 kV steel tower transmission line from Fort Augustus to Fort William. Kennedy and Donkin, 12 Caxton St, London, S.W.1. Deposit £2. 2s.—Advertised in this issue.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 2 February

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	226½	+6	285
„ (3 months)	214½	+2½	—
LEAD, refined pig, min. 99·97% purity (cash)	85¼	+¾	94¾
„ (3 months)	84	−¼	92½
TIN, refined, min. 99·75% purity (settlement)	655	+5	974
„ (3 months)	635	+7	952
ALUMINIUM, ingots 99-99·5%	156	—	166
ZINC, virgin, min. 98% purity (cash)	72½	+¼	82¾
„ (3 months)	71	+½	83¼
RUBBER No. 1, RSS, spot (per lb.)	16⅞d.	+⅜d.	23½d.
„ c.i.f. basis, ports, Apr. (per lb.)	16⅜d.	+⅛d.	22¾d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	51½	—	52
Mild Steel Tape (0·014 in.)	40	—	39¾

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.*

22 Feb.—Brazil. Comissao Estaduel de Energia Electrica inviting tenders for supply of 26,000 electricity supply kWh meters, induction type, single phase, for inserting direct in a.c. circuits of 50 c/s. B.o.T. (Ref.: ESB 2231/54).*

3 Mar.—New Zealand. Supply (under No. P and T 150/6416) of 50 miles of quadruple cable, polythene insulated and polyvinal chloride sheathed. Director General (Stores Div.), G.P.O., Wellington.

5 Mar.—South Africa. Supply and erection of one 7-panel metalclad switchboard, 33 kV, 1,000 MVA breaking capacity single bus-bar, remote electrically operated, in two sections. (Tender No. E 2463). Town Clerk, Municipal Buildings, West St, Durban. B.o.T. (Ref.: ESB 1903/54).*

11 Mar.—New Zealand. Supply of total of 829,170 ft of telephone cable (under No. P and T 150/6768) Director General (Stores Div.), G.P.O., Wellington.

9 Mar.—New Zealand. Director General (Stores Div.), G.P.O., Wellington, invites tenders (under No. P and T 150/6742) for supply of petrol and diesel engine alternator sets. B.o.T. (Ref.: ESB 1834/54).*

12 Mar. — Uruguay. Tenders (EXP 350/L/52) invited by Figorifico Nacional for supply of 250 h.p. water-cooled 4-cycle diesel engine coupled to 3-phase 50 c/s alternator with output of 220 kVA at 220 V between phases and 0·8 power factor. B.o.T. (Ref.: ESB 1654/54).*

15 Mar.—Canada. Supply and installation at Brandon, Manitoba, power station of two 30,000 kW steam turbo-generator sets, and possibly a third later. Each should have rating of 35,294 kVA at 0·5 psig hydrogen pressure, 0·85 power factor, 13,800 V, 3-phase, 60 c/s. Manitoba Hydro-Electric Board, Electric Railway Chambers (10th floor), Winnipeg. B.o.T. (Ref.: CRE 1031/54).*

11 May—New Zealand. Supply of one 10 MVA 100/11 kV TCOL transformer bank and spare unit for Gisborne substation, for State Hydro-Electric Dept. Plans available from N.Z. Govt. office in London. Deposit £100 and amount of bonds £930.

11 May—New Zealand. Supply of four single-phase, double-wound, transformer units, each of 3,333 kVA, 110/6·35 kV, 50 c/s, outdoor type, oil immersed, self-cooled and tap changing on load. (Tender No. 254.) State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 1836/54).*

11 June—New Zealand. Waitemata Electric Power Board invite tenders for supply of three 10 MVA and five 7·5 MVA double-wound transformers. Board is at 81 Albert St, Auckland. B.o.T. (Ref.: ESB 1862/54).*

Contracts Placed

B.E.A. 415 V contactor control gear and associated equipment at Castle Donington, Contactor Switchgear Ltd.; One 120 MVA generator transformer at Willington A, English Electric Co., Ltd.; Coal handling plant at Nottingham, International Combustion Ltd.; High pressure pipework and valves at Bold A, Aiton and Co., Ltd.; Auxiliary switchgear at Ince, English Electric Co., Ltd.; Two 100,000 lb/hr boilers at York, Richardsons Westgarth (Hartlepool) Ltd.; Circulating water pipework at Carrington, T. B. Pearson and Sons, Ltd.; and One 350,000 lb/hr boiler and structural steelwork at Huncoat, Simon-Carves Ltd.

Trade Notes

New Offices. The British Insulated Callender's Construction Co., Ltd., recently moved to new premises at 30 Leicester Square, London, W.C.2. Telephone, Trafalgar 7777. The move has been made necessary by the increasing activities of the company, and is expected to improve overall efficiency still further by bringing together various offices which were previously situated in different parts of London. The new office block, with a gross floor area of 50,000 sq ft, faces on to both Leicester Square and Charing Cross Rd. It should be noted that the central administration offices of the parent company, British Insulated Callender's Cables Ltd., remain at 21 Bloomsbury St, W.C.1.

New 'Phone No. The Birmingham works telephone number of William McGeoch and Co., Ltd., has been changed to Victoria 3371.

BUSINESS PROSPECTS

Home

Aylsham (Norf.) It is proposed to build secondary modern school in Sir William's Lane.

Bangor (Caern.) Plans approved for laboratory extension at Bryn Adda for Ministry of Agriculture.

Bootle T.C. Erection of county secondary modern school at Netherton. Borough Surveyor, Town Hall.

Bollington (Ches.). Eric Britton and Co., Ltd., of Ingersley Vale, propose to build factory. Inquiry to be held shortly.

Cardiff. T.C. asked to approve plans for erection of offices at Cathays Park costing £285,000. Application to be made to borrow £332,224 for construction of central swimming baths in Wood St.

Dunfermline. Dean of Guild Court has approved plans for 52 houses on Aberdour Rd site.

Durham. Following schools may be included in 1954-55 building programme: S. Stanley, Felling Wardley, and Trimdon Village county infants' schools.

East Riding. Erection of secondary school at Brough. County Architect, County Hall, Beverley.

Fleet (Hants). Plans approved for erection of factory in Albert St, for County Commerçial Cars Ltd.

Felling (Dur.). Felling Zinc Oxide Co., Ltd., to erect canteen and laboratory in Tyne St. Plans by Fennell and Co., Bridge End Chambers, Chester-le-Street.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Vibron. 724,242. Class 9. Electronic measuring instruments. Electronic Instruments Ltd., 11 to 21 Red Lion St, Richmond, Surrey.

Benjamin-Leader. B720,751. Class 11. Electric light fittings. Benjamin Electric Ltd., Brantwood Works, Brantwood Rd, Tottenham, N.17.

Chemring. 723,296. Class 9. Scientific, nautical, surveying and electrical apparatus and instruments, etc. Chemring Ltd., 62/64 Temple Chambers, Temple Ave, E.C.4.

Microtex. 724,275. Class 9. Separator plates for electric accumulators. Dunlop Rubber Co., Ltd., Fort Dunlop, Erdington, Birmingham 24.

Bak-Vac. 724,355. Class 9. Electric vacuum cleaners. New Welbeck Ltd., 94 New Bedford Rd, Luton, Beds.

Vectorad. 724,811. Class 11. Combined radiators and convection heaters for space heating. Dorset Light Industries Ltd., 70 East St, Bridport, Dorset.

Queensway. B723,894. Class 9. Electric kettles. Dependable Products Ltd., Factory G.97, Queensway, Team Valley Trading Estate, Gateshead 11.

Telytran. 724,104. Class 9. Telemetric instruments; and electrical apparatus for producing and transmitting direct current proportional to the electrical power input measured by such telemetric instruments. Measurement Ltd., Terminal House, Grosvenor Gdns, S.W.1.

East Grinstead U.D.C. Construction of 38 houses on Blackwell Farm estate. B. J. Cornelius, Surveyor to the Council, East Court.

Glasgow. Clyde Navigation Trust considering modernisation of Brodielaw and provide new luxury passenger terminal.

Hartlepool. Extensions costing £150,000 to be carried out at Pallister works of Steetley Magnesite Co., Ltd. Consultants are L. G. Mouchel and Partners, Victoria St, London, S.W.1.

Houghton-le-Spring. N. Eastern Trading Estates Ltd. to build factory at Fence Houses for N. Hyer Ltd. Architect is W. Holford, 80 Bedford St, Liverpool.

Ipswich T.C. Construction of extension to Northgate grammar school for boys. Johns and Slater, architects, 32 Foundation St.

Jarrow-on-Tyne. N. Eastern Trading Estates Ltd. to build £17,000 canteen on Bede Trading estate.

Leamington. Plans approved for new factory and offices for Kigass Ltd. on trading estate to south of borough.

Liverpool T.C. Erection of secondary modern school in Arnot St. City Architect, Blackburn Chambers, Dale St, Kingsway. Also plans approved for Corporation Health and Welfare office building at Hatton Garden. Estimated cost £100,000.

London. New air terminal proposed in Bayswater comprising £250,000 four-storey building. Consulting engineers are C. W. Glover and Partners, 54 Victoria St, S.W.1. Also, Landis and Gyr Ltd. propose new factory and offices in Victoria Rd, W.3. Architects are Huckle and Durkin, 55 Queen Anne St, W.1.

Louth T.C. Seventy-two houses to be built at cost of about £92,000.

Longbenton U.D.C. Tenders to be invited for erection of 130 houses at Fordley. It is proposed to install electricity in 146 houses at a cost of £5,987.

Maidenhead. Ellay Tubes Ltd., proposes to build factory on Curls Lane industrial estate.

Manchester. New factory to be built at Northenden for Pipeweld Ltd., of Park Rd, Timperley.

Merionethshire. Erection of secondary school at Harlech. Richards and Trollope, 14 Sackville St, London, W.1.

N. Ireland. Construction of 40 dwellings in Islandmagee Rd, Whitehead. N.I. Housing Trust, 12 Hope St, Belfast.

Northumberland. Final plans approved for Longbenton county modern school, estimated to cost £164,000. Quantity surveyors are J. W. Summers and Partners, 33 Jesmond Rd, Newcastle.

Norfolk. County Council asked to approve installation of electricity in Wendling primary and Wramplingham voluntary controlled schools.

Oswestry T.C. Erection of 76 houses on Middleton Rd site. J. E. Taylor, Borough Surveyor, Guildhall.

Peterborough. Wiring at Memorial Hospital to be carried out by E. Anglian Hospital Board. Cost this year will be £2,000 and next year £1,500.

Prestwick T.C. Approval received for erection of 78 houses in Bellevue Rd at estimated cost of £141,741.

Rochdale T.C. Diocese of Manchester are planning erection of dual purpose ecclesiastical building.

Rothwell U.D.C. Consideration being given to provision of electricity to all council houses.

Sheffield T.C. Erection of 22 houses on Brushes, Stubbin and Parson Cross estates. Also 144 dwellings on Greenhill estate. J. L. Womersley, City Architect, Town Hall.

Scone (Perth). War Office approved erection of new 3-storey Black Watch depot at Spoutwells. Cost estimated at £500,000.

Stockport T.C. Proposed to renew electrical installation on first floor of Town Hall, Large Hall and Annexe. Estimated cost £15,100.

Stamford T.C. Electricity to be provided to all pre-war council houses at cost of about £12,150.

Tynemouth T.C. Tenders to be invited for erection of 220 houses on Chilton Grange North estate.

Urmston (Lancs). Plans approved for erection of factory at Trafford Park for Victor Bladen (Manchester) Ltd. Also Brotherton and Co., Ltd., propose to build factory in district, and Esso Petroleum Co., Ltd., a laboratory.

Overseas

U.S.A. Gordon Agencies, 1506 North Western Ave, Hollywood 27, wish to obtain sole U.S. agencies for high fidelity electronic sound equipment.

Hong Kong. Representation of U.K. manufacturer of high fidelity loud speakers and amplifiers sought by Scientific Service Co., 447 Alexandra House, Hong Kong.

Gazette Announcements

COMPANIES ACTS

Winding-up

Etherington and Partners Ltd., electrical manufacturers, wholesalers, etc. At first meeting of creditors Official Receiver reported that winding-up order was made on 14 Dec. Company was formed in Mar., 1950, with name Brooks and Bohm (Electrical) Ltd. Statement of affairs disclosed unsecured liabilities of £7,793, of which £5,147 was due to trade creditors; £203 outstanding expenses; £77 bank overdraft; and £2,356 loans. Assets, after preferential claims of £14 were deducted, estimated to produce £2,197. Deficiency as regards creditors was expected to be £5,586. Resolution passed for appointment of David Morgan, accountant, 100 Park St, W.1, as liquidator, with a committee of inspection.

Fairclough (Leeds) Ltd. Supplemental dividends of 3¼d. in £ payable at Official Receiver's Office, 29 East Parade, Leeds, on 12 Feb.

Avery Ward and Co., Ltd. Meeting of members will take place at St. Paul's House, 61-63 St. Paul's Churchyard, E.C.4, on 3 Mar. at 3.30 p.m. to receive liquidator's report.

BANKRUPTCY ACTS

Release of Trustee

Lincoln. William S. Forrest, electrical engineer trading at 45 Cartholme Rd. Lincoln. Trustee was E. C. Stimpson, Official Receiver, 27 Regent St, Park Row, Nottingham.

MEETINGS TO NOTE

THURSDAY, 4 FEB.

I.E.S. (Cardiff).—Colour and Dress Display. Elect. Offices, The Hayes, 5.45 p.m.

I.E.S. (Glasgow).—Discussion on "Street Lighting," J. M. Ward and F. N. Rush. 39 Elmbank Cres, 6.30 p.m.

I.E.S. (Glos. and Cheltenham).—"Electrical Installations in Nylon Yarn Factory," B. C. Robinson. G.E.C. Co., Ltd., 2 St. Aldgate St, Gloucester, 6.30 p.m.

I.E.S. (Nottingham).—"Natural and Artificial Lighting in Factories," W. A. Allen. Elect. Offices, Smithy Row, 6 p.m.

BRIT. INSTN. OF RADIO ENGINEERS (Scottish).—"Electronics in Film Making," W. D. Kemp and B. R. Greenhead. 39 Elmbank Cres, Glasgow, 7 p.m.

BRIT. INSTN. OF RADIO ENGINEERS (N. Western).—"Police Radio, its Past, Present, and Future Possibilities," I. Auchterlonie. College of Technology, Sackville St, Manchester, 7 p.m.

I.E.E. (London).—"Manchester - Kirk o'Shotts TV Radio Relay System," G. Dawson, L. L. Hall. K. G. Hodgson, R. A. Meers, and J. H. H. Merriman. Savoy Place, W.C.2, 5.30 p.m.

A.S.E.E. (S. London).—"Rectifiers," K. B. Blake. Cafe Royal, Croydon, 8 p.m.

FRIDAY, 5 FEB.

I.E.S. (Swansea).—Annual dinner and dance.

E.I.B.A. (Hants and Dorset).—Fourth annual ball at South Parade, Pier Pavilion, Southsea.

I.E.E. (S. Midland).—Annual dinner at Grand Hotel, Birmingham, 6.30 p.m.

A.S.E.E. (Liverpool).—Films. 9 Whitechapel, 7.30 p.m.

MONDAY, 8 FEB.

I.E.S. (Sheffield).—"Lighting in Design of Schools," A. Pott. University Western Bank, 6.30 p.m.

LEICESTER ELECTRICAL SOC.—"Photo-Electric Cells in Industry," G. A. G. Ive. Elect. Offices, Charles St, 7 p.m.

JNR. INSTN. OF ENGINEERS (N. Western).—"Special Electro-Mechanical Devices," F. E. Bancroft. Engrs. Club, Albert Sq, Manchester, 7.30 p.m.

I.E.E. (London).—Discussion on "Will it be possible to abolish meters entirely?" H. S. Petch and M. Whitehead. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Eastern).—"First Stage of Electrification of Estrada de Ferro Santas a Jundiai (Pate Sao Paulo Railway)," R. J. B. Chatterton and D. H. Rooney. Neville Hall, Westgate Rd, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Supply and Utilisation).—"Royal Festival Hall: Electrical Installation," J. G. Hunter. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (Western).—"Technical Arrangements for Sound and TV Broadcasts of Coronation," W. S. Procter, M. J. L. Pulling, and F. Williams. S. Wales Inst. of Engrs., Park Place, Cardiff, 6 p.m.

I.E.E. (Norwich).—"Modern Developments in Domestic and Industrial Heat Pumps," J. A. Sumner. Stuart Hall, 7.30 p.m.

A.S.E.E. (Central London).—"Electrical Equipment of Aircraft." R. D. Jones, St. Ermin's Hotel, Caxton St, S.W.1, 7 p.m.

TUESDAY, 9 FEB.

I.E.S. (London).—"Flameproof Lighting," D. A. Strachan. Lighting Service Bureau, W.C.2, 6 p.m.

NEWPORT ELECTRIC CLUB.—"Planned Inspection as applied to Electrical Gear," S. R. Phelps. Tredegar Arms Hotel, 7 p.m.

ELECTRICAL INDUSTRIES CLUB.—Luncheon at Connaught Rooms, W.C.2. Guest speaker: Sir Norman Kipping.

I.E.E. (N. Midland).—"Special Effects for TV Studio Productions," A. M. Spooner and T. Worswick. Elect. Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N.W. Supply).—"Service Experience of Effect of Corrosion on Steel-Cored Aluminium Overhead-Line Conductors," J. S. Forrest and J. M. Ward. Engineers Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (N. Ireland).—"Testing and Specification of Bushings in relation to Service Conditions," H. Barker and H. Davies. Presbyterian Hostel, Howard St, Belfast, 6.15 p.m.

I.E.E. (S.E. Scotland).—"Fluorescent Discharge-Tube Circuits and Operating Problems," J. Cates. Heriot-Watt College, Edinburgh, 7 p.m.

A.S.E.E. (N.W. London).—"Motor Control Gear." R. F. Mathieson, Rest Hotel, Kenton Lane, Kenton, 8.15 p.m.

A.S.E.E. (S.E. London).—Films at Congregational Church Hall, Court Rd, Eltham, 8 p.m.

WEDNESDAY, 10 FEB.

I.E.S. (Huddersfield).—"Lighting for Enjoyment," T. O. Freeth. 19-23 Northgate, Halifax, 7.30 p.m.

BRIT. INSTN. OF RADIO ENGINEERS (N. Eastern).—"Some Aspects of Micro-wave Aerial Design," J. Bilbrough. Neville Hall, Westgate Rd, Newcastle, 6 p.m.

INCORP. PLANT ENGINEERS (E. Midland).—"Air Conditioning," A. Peel. Gas Showrooms, Parliament St, Nottingham, 7 p.m.

I.E.E. (London Radio).—"Basic Ground-Wave Propogation Characteristics in the 50-800 Mc/s Band," J. A. Saxton. "Ground-Wave Field Strength Surveys at 100 and 600 Mc/s," J. A. Saxton and B. N. Harden. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs).—"Some Design Features of Semi-Outdoor Power Station at Ince," F. H. S. Brown. Elect. Offices, Friargate, Preston, 7.15 p.m.

I.E.E. (N. Scotland).—"Fluorescent Discharge-Tube Circuits and Operating Problems," J. Cates. Caledonian Hotel, Aberdeen, 7.30 p.m.

I.E.E. (Southern).—"Design Features of Semi-Outdoor Power Station at Ince," F. H. S. Brown. Elect. Board H.Q., Hove, 6.30 p.m.

A.S.E.E. (Birmingham).—"Power Factor Correction." H. R. Herning, Chamber of Commerce. 95 New St, 7 p.m.

A.S.E.E. (Bradford).—"Electronics." E. Craven, Midland Hotel, 7.30 p.m.

A.S.E.E. (York).—"Joints for Power Cables." B. A. Maxted, City Hotel, Lendal, 7.30 p.m.

THURSDAY, 11 FEB.

I.E.S. (Manchester).—"Lighting for Enjoyment," T. O. Freeth. Elect. Offices, Town Hall Extension, 6 p.m.

E.P.E.A. (Merseyside).—"Safety Precautions in Electric Supply Industry," L. A. Corney. Elect. Offices, Whitechapel, Liverpool, 7 p.m.

SOC. OF INSTRUMENT TECHNOLOGY.—"Automatic Combustion Control," J. C. Farquhar. Manson Hse., Portland Place, W.1, 7 p.m.

INST. OF WELDING (Slough).—"Resistance Welding in Production," E. A. Whittaker. Community Centre, Farnham Rd, 7.30 p.m.

INCORP. PLANT ENGINEERS (N.-East).—"Metallurgy," J. Rolston. Roadway Hse., Oxford St, Newcastle, 7 p.m.

I.E.E. (London).—"Modern Review of Fundamental Electromagnetic Theory," P. Hammond. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland).—"Fluorescent Discharge-Tube Circuits and Operating Problems," J. Cates. Royal Hotel, Dundee, 7 p.m.

I.E.E. (S. Western).—"Printed and Potted Electronic Circuits," G. W. A. Dummer and D. L. Johnston. Dowlish Ford Mills, Ilminster, 4.30 p.m.

I.E.E. (Swansea).—Discussion on "Automatic Control," Prof. D. N. Cass-Beggs. Public Library, Alexandra Rd, 6 p.m.

I.E.E. (London Students).—"Industrial Consumer Installation Practice," J. J. Peacock. Public Library, Chelmsford, 7 p.m.

FRIDAY, 12 FEB.

I.E.S. (Bradford).—"Lighting for Enjoyment," T. O. Freeth. Elect. Offices, 45-53 Sunbridge Rd, 7.30 p.m.

TELEVISION SOC.—Fleming Memorial lecture on "Colour TV," G. G. Gouriet, Royal Instn., Albemarle St, W.1, 7 p.m.

JNR. INSTN. OF ENGINEERS (London).—"Steam Utilisation and Heat Conservation," L. Clegg. Townsend Hse., Greycoat Place, S.W.1, 7 p.m.

I.E.E. (N. Staffs).—Annual dinner at Crown Hotel, Stone, 7 p.m.

I.E.E. (London Students).—Conversazione and Dance at Savoy Place, W.C.2, 6.30 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Winstanley (Decorations) Ltd., Windsor House, 46 Victoria St, S.W.1. Sanitary, heating, lighting, ventilating, electrical, mechanical and general engineers, builders and building contractors, etc. Nom. cap.: £25,000. Dirs.: C. Pitchford and Doreen S. Ware.

J. A. Johns and Son Ltd., 12 Grants Walk, St. Austell, Cornwall. Motor, aeronautical, electrical, mechanical and general engineers, etc. Nom. cap.: £4,000. Permt. dirs.: A. A. Johns and Mrs E. M. Johns and Mrs S. Hancock.

Silverline Signs and Displays Ltd., The Mission Hall, Coombe Rd, Sydenham, S.E.26. Manufacturers of and dealers in glass and electric signs, window displays, etc. Nom. cap.: £1,000. Dirs.: T. A. Mellor and Joan L. Mellor.

Barlow Bros. and Co., Ltd., 5 Betterton St, W.C.2. To take over the business of electrical contractors carried on at Betterton St, W.C.2, as "Barlow Bros. and Co." Nom. cap.: £10,000. Dirs.: A. H. Neeld, A. R. Field, A. E. Saunders, F. J. Thaxter, E. W. White and R. H. Young.

J. N. Somers Ltd., Eagle House, 109 Jermyn St, S.W.1. Manufacturers of and dealers in aircraft, electrical and radio goods, etc. Nom. cap.: £3,000. Dirs.: J. N. Somers, and J. R. Pullan.

Byfleet Electronics Ltd. Nom. cap.: £100. Dirs.: not named. Subs.: W. G. Hall, 85 Brighton Rd, Surbiton, Surrey and D. V. Cursons, 10 Claremont Rd, West Byfleet.

Aquamix Ltd., 25 Birley St, Blackpool. Manufacturers of and dealers in refrigerators, air-conditioning, heating, cooking and lighting equipment, etc. Nom. cap.: £100. Dirs.: A. W. Lambert and M. Shaw.

Gydar Industrial Designers Ltd., 3 Union St, Bath. Industrial designers, consulting, mechanical, electrical, motor, agricultural and general engineers, etc. Nom. cap.: £100. Dirs.: V. Sutcliffe and Phyllis Sutcliffe.

Binns

NEW SUNDERLAND STORES

one of the largest retail stores in the North East

Architects: William & T. R. Milburn (William Milburn F.R.I.B.A.)

Electrical Contractors:
F. Reid Ferens & Co. Ltd.
Stockton Road, Sunderland

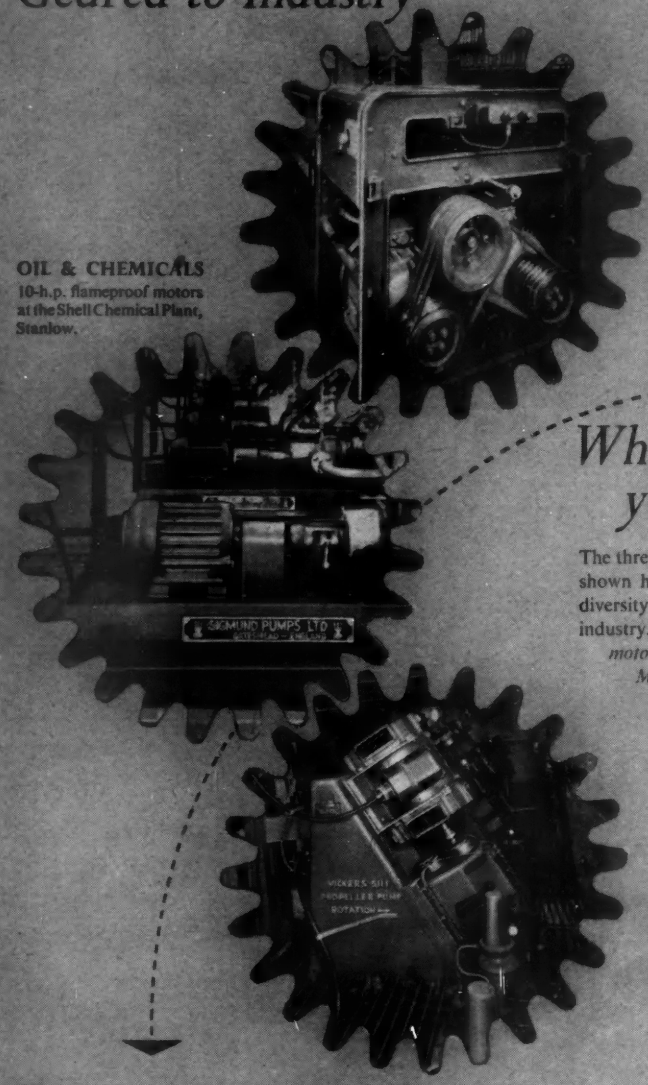
Wired throughout with

HENLEY CABLES

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS TO THE LATE KING GEORGE VI

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
51-53 HATTON GARDEN, LONDON, E.C.1

Geared to Industry



OIL & CHEMICALS
10-h.p. flameproof motors at the Shell Chemical Plant, Stanlow.

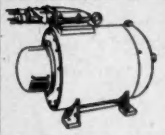
TEXTILES
10-h.p. dual motor drive for cotton ring spinning frames (Platt Bros. Sales Ltd.), at Victoria Mills, J. & J. Hayes, Leigh.

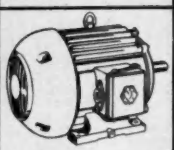
Whatever you make...

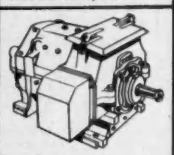
The three uses for Metrovick Motors shown here are typical of the great diversity of applications throughout industry. *Whenever you need electric motors why not let us assist you? Metrovick motors are available from stock, or on short deliveries.*

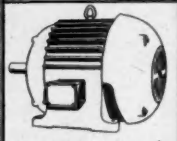
WATER SUPPLIES
42-h.p. M-V Motors at Lune Booster Station—Thirlmere to Manchester scheme.

F.H.P. motors for washing machines, refrigerators, tape recorders, comptometers, food industries, petrol pumps, etc.


Flameproof motors for underground service in coal mines, for gas works and chemical industries.


Non-flameproof motors for applications on the surface at coal mines, e.g., coal washeries and conveyors.


Standard motors and special mill type motors for Iron and Steel industries.


Specialised drives for machine tools, cranes, paper making, lifts, cement, power station and marine duty.

METROVICK motors can help you make it

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Member of the AEI group of companies

Leading Electrical Progress

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

OXFORDSHIRE COUNTY COUNCIL

Proposed Secondary Modern School, Banbury

APPLICATIONS from Electrical Contractors desirous of tendering for the electrical installation of this school should reach the County Architect, Park End St Offices, Oxford, not later than 10 Feb., 1954.

The County Council reserves the right to select from the list of applications the firms to be invited to submit competitive tenders, and does not bind itself to accept the lowest or any tender submitted.

Specifications, schedules, layout and forms of tender will be issued during the week commencing 15 Feb., 1954, to those invited to tender, for return on or about 8 Mar., 1954.

GERALD GALE BURKITT,
Clerk of the Council.

County Hall,
Oxford.
29 Jan., 1954. (G 544)

BOROUGH OF MACCLESFIELD

Group "A" Sodium Discharge Street Lighting

PARK ST, PARK LANE, CONGLETON RD AND OXFORD RD

TENDERS are invited for the supply and erection of 90 sodium lighting units mounted on reinforced concrete columns.

Specification, Bill of Quantities and Form of Tender may be obtained from Mr J. H. Dossett, A.M.I.C.E., Borough Engineer, Town Hall, Macclesfield, on payment of a deposit of £2. 2s. to be returned on receipt of a bona fide tender.

Tender, with completed Bill of Quantities, enclosed in plain sealed envelope, endorsed "Street Lighting—Park Lane, etc.", to be delivered to the undersigned not later than noon on Saturday, 20 Feb., 1954.

The Council do not bind themselves to accept the lowest or any tender.

WALTER ISAAC,
Town Clerk.

Town Hall,
Macclesfield.
29 Jan., 1954. (G 543)

BOROUGH OF ILFORD

MAIN DRAINAGE SCHEME
SUPPLY OF SEWAGE PUMPING PLANT

QUOTATIONS are invited for the supply of vertical spindle pumps, together with motors and other ancillary equipment. The pumps must be capable of dealing with unscreened sewage and will be installed in a new pumping station to be constructed at Roden St, Ilford.

Documents may be obtained from the Borough Engineer, Town Hall, Ilford on payment of a deposit of £2. 2s. which will be returned on receipt of a bona fide quotation.

Quotations are to be delivered in the envelope provided by or before the first post on Wednesday, 24 Mar., 1954.

The Council do not undertake to accept the lowest or any quotation. (G 492)

AIREBOROUGH URBAN DISTRICT COUNCIL

Street Lighting—Class B

HIGH STREET, IVEGATE AND HENSHAW LANE, YEADON.
TENDERS FOR: 1. SUPPLY OF EQUIPMENT. 2. ERECTION.

THE Council invite separate tenders for the supply of equipment for, and erection of, 55 (approx.) Class B M.V. and FLUORESCENT Street Lighting Points in High St, Ivegate, and Henshaw Lane, Yeadon, in accordance with a Specification and Plan to be obtained from the Council's Engineer and Surveyor on the payment of a deposit of £2, which will be returned on receipt of a bona fide tender.

The Council reserve the right to accept Tenders Nos. 1 and 2 from two different firms and also the right to carry out their own erection if they think fit.

Tenders in a plain sealed envelope bearing no mark indicating the sender and endorsed "Tender for Class B Lighting" are to be received by the undersigned not later than Saturday, 27 Feb., 1954.

The lowest or any tender will not necessarily be accepted.

Council Offices, RALPH H. HULME,
Micklefield House, Clerk of the Council.
Rawdon, Nr. Leeds.
5 Feb., 1954. (G 549)

COUNTY BOROUGH OF DEWSBURY

STREET LIGHTING DEPARTMENT

TENDERS are invited for the supply of No. 1 Bijou Mantles; electric lamps, 230 and 240 Volts; electric cable; 100-200 Watt lanterns, open refractor type; swan-neck brackets and spigots; swan-neck brackets complete with control gear box; gas lanterns; cast-iron and concrete lighting standards; and uniform reefer jackets.

Form of Tender, Schedule and General Conditions, and any further information required, can be obtained from the Street Lighting Engineer, 27 Battye St, Dewsbury, on the receipt of a foolscap stamped and addressed envelope.

Tenders, enclosed in a plain sealed envelope, endorsed "Tender for Electric Lamps" or any of the other specified materials, must be sent to me by noon on Thursday, 25 Feb., 1954.

A. NORMAN JAMES,
Town Clerk.

Town Hall,
Dewsbury.
26 Jan., 1954. (G 491)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Fort Augustus—Fort William 132 kV line

TENDERS are invited for the construction of 132 kV Steel Tower Transmission Line from Fort Augustus (near Loch Lundie) to Fort William.

Tender Documents may be obtained on application to Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1, accompanied by a deposit of £2. 2s. (returnable).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3. (G 550)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF SUB-AREA ACCOUNTANT
NO. 2 SUB-AREA (BOLTON)

APPLICATIONS are invited for the appointment of Sub-Area Accountant in the No. 2 Sub-Area at a salary of £1,450 x £50 p.a. to a maximum of £1,600 p.a.

Applicants should have wide knowledge and experience of accountancy, preferably in the Electricity Supply Industry. The possession of appropriate professional qualifications will be an advantage.

Applications stating age, qualifications and experience, present post and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Rd, Manchester 8, not later than 19 Feb., 1954.

APPOINTMENT OF DISTRICT COMMERCIAL ENGINEER
SOUTH-WEST FYLDE DISTRICT

Duties will include organisation and control of all commercial staff and functions in the District: supply of information and advice to consumers on electricity utilisation, tariffs, terms, apparatus and all matters concerning electricity services: organisation and supervision of maintenance work on consumers' premises including emergency service, routine testing and repair of domestic appliances: control of Service Centres and Exhibitions: supervision of consumer records.

Salary Scale: £1,002/1,046 p.a. Grade F.2. N.J.B. Conditions.

Applications to the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune St, Preston, by 13 Feb., 1954. (G 519)

ELECTRICAL DRAUGHTSMAN

REQUIRED by BRITISH ELECTRICITY AUTHORITY, HEADQUARTERS, Bankside, London. Candidates should preferably have experience in the layout of 132 kV Substations or diagrams in connection therewith but this is not essential. Starting salary according to qualifications and experience within N.J.B. Grade 6, Schedule D (£458—£595 inclusive). Pension Scheme. One Saturday morning in four on duty.

Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1. Quote reference EN/447. (G 542)

REPEAT ADVERTISEMENT

CITY OF LEEDS

Street Lighting Department

APPOINTMENT OF TECHNICAL AND ADMINISTRATIVE ASSISTANT

APPLICATIONS are invited for the above mentioned post, at a salary with A.P.T. Grade 6 (£670—£735) of the National Scheme of Conditions of Service. The appointment will be subject to the Local Government Superannuation Acts, 1937 to 1953, medical examination and to termination by one month's notice on either side.

Applicants must have considerable technical and administrative experience with a Street Lighting Authority or comparable commercial undertaking.

Applications with details of age, qualifications and experience must reach the undersigned not later than 20 Feb., 1954, endorsed "Assistant."

Canvassing in any form, either directly or indirectly, will be a disqualification.

Note—Candidates who submitted applications in response to the original advertisement should indicate by letter if they desire their applications to be reconsidered.

L. A. DOXEY,
Engineer.

Springwell St,
Leeds, 12. (G 529)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

CIVIL ENGINEERING DRAUGHTSMEN
CONSTRUCTION DEPARTMENT
VACANCY NO. 1/54

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 5 (£567—£671 per annum) or Grade 6 (£433—£567 per annum) of Schedule D of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL) CONSTRUCTION DEPARTMENT
VACANCY NO. 2/54

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement Grade 5 (£567—£671 per annum) and Grade 6 (£433—£567 per annum) of Schedule D according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL) CONSTRUCTION DEPARTMENT
VACANCY NO. 3/54

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567—£671 per annum) or Grade 6 (£433—£567 per annum) of Schedule D of the National Joint Board Agreement.

CONTROL ENGINEER, AVON POWER STATION
VACANCY NO. 12/54

Candidates should have had a good technical training and be experienced in Control Room operation.

Salary and conditions will be in accordance with the National Joint Board Agreement, Class E, Grade 10 (£555—£569 per annum).

The closing date for this appointment is 18 Feb., 1954.

SECOND ASSISTANT ENGINEER (CIVIL)
DIVISIONAL HEADQUARTERS
VACANCY NO. 14/54

Preference will be given to applicants who have a degree in Civil Engineering, are Corporate Members of the Institution of Civil Engineers or possess equivalent qualifications.

They should have had experience in the design and construction of heavy foundations, river works, structures in reinforced concrete and steel and other civil engineering works associated with the design and construction of Power Stations.

Experience in the preparation of specifications, bills of quantities and estimates will be a recommendation.

Salary will be within Schedule C, Class AX/DX, Grade 2 (£834—£1,053 per annum) of the National Joint Board Agreement.

The closing date for this appointment will be 18 Feb., 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

APPOINTMENT OF SENIOR ASSISTANT ACCOUNTANT

APPLICATIONS are invited from Chartered, Incorporated or Certified Accountants with some experience in the Accounting and Stores branches of a modern industrial concern, preferably in an Electricity Supply Undertaking, to fill the post of Senior Assistant Accountant with the Trinidad and Tobago Electricity Commission. Preference will be given to applicants who are also Members of the Institute of Costs and Works Accountants.

The commencing salary is £1,045 a year, rising by £27. 10s. to £1,127. 10s. When the total sales of electricity exceed 100 million units the salary range will be £1,155 to £1,237. 10s. A cost of Living Allowance of £25 per year and a House Allowance—maximum £10. 8s. 4d. if married and £6. 5s. if single—per month are also payable. An Outfit Allowance of £60 will be granted on arrival.

The successful applicant will be required to undergo a medical examination. He will be provided with first class passages for himself, his wife and two children up to the age of 18, on appointment. Leave passages to the United Kingdom or equivalent will be provided every three years. Vacation, casual and sick leave on full pay.

General details of Trinidad's climate, income tax, etc., can be obtained from the West India Committee at 40 Norfolk St, London, W.C.2.

Applications giving full details of qualifications, experience, and personal particulars, together with two recent references, should reach the General Manager, Trinidad and Tobago Electricity Commission, P.O. Box 121, Port-of-Spain, Trinidad, B.W.I., on or before 28 Feb., 1954. (G 523)

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Tyne Sub-Area

JUNIOR ENGINEERS at Tyne sub-Area Headquarters, Newcastle-upon-Tyne. Applicants should have a qualification equivalent to the Higher National Certificate in Electrical Engineering and suitable practical experience. Salary, Schedule "A," Class L—£451/£547. Starting salary will be dependent on qualifications and experience. N.J.B. Conditions of service.

Wear Sub-Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER, South Shields. Applicants should perferably be graduate or corporate members of I.E.E., or possess equivalent qualification in Electrical Engineering and have experience in the utilisation of electrical energy in commercial and domestic premises, knowledge of installation work and be conversant with tariffs, sales and all aspects of consumer service. Salary, Class "E," Grade 6, £699/£725. N.J.B. conditions of service.

Applications stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), The North Eastern Electricity Board, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (G 531)

SOUTHERN ELECTRICITY BOARD
No. 2 (Newbury) Sub-Area Office

SUB-AREA COMMERCIAL ASSISTANT
(SALES AND CONTRACTING)

SALARY N.J.B. Class L, Grade 10 (£766-£794 per annum). N.J.B. Conditions of Service.

Applicants should have had experience in installation work including the preparation of specifications and estimates, street lighting and maintenance of domestic apparatus. Knowledge of refrigeration work and exhibitions would be an advantage.

The successful candidate will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, and returned to him in envelopes suitably endorsed not later than 15 Feb., 1954. (G 533)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

APPLICATIONS are invited for the following appointments:

1. POWER STATION SUPERINTENDENT, Skelton Grange Power Station, Leeds. (Ultimate capacity 360 MW.)

Salary £1,235-£1,289 per annum. Class H, Grade 1, National Joint Board Agreement.

2. DEPUTY POWER STATION SUPERINTENDENT, Keadby Power Station, near Scunthorpe. (Ultimate capacity 360 MW.)

Salary £1,035-£1,081 per annum. Class H, Grade 3, National Joint Board Agreement.

Applicants should have had wide experience in the operation and maintenance of large modern power station plant, including Pulverised Fuel Fired Boilers, and have held a position of responsibility involving the control of staff.

Candidates should preferably be Corporate Members of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers or should hold equivalent qualifications.

Applications on Forms A.E.6/ACT, obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds, 7, to be returned not later than 14 days after the appearance of this notice.

G. A. VOWLES,
Divisional Controller.
(G 534)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

APPLICATIONS are invited for the following positions in the Generation (Operation) Department. N.J.B. service conditions, superannuable appointments, salaries within Schedule "A" of the Agreement:

(*a*) SHIFT CHARGE ENGINEER at Nechells "A" Generating Station, Grade F.7, commencing at £697 per annum (Vacancy No. 597MD).

(*b*) JUNIOR ENGINEER at Nechells "B" Generating Station, Grade J.18, commencing at £402 per annum, rising to Grade J.14, £545 per annum (Vacancy No. 598MD).

(*c*) JUNIOR ENGINEER at Hams Hall "A" Generating Station, Grade J.18, commencing at £402 per annum, rising to Grade J.14, £545 per annum (Vacancy No. 599MD).

Applicants should have received a sound technical training and in particular for (*a*) practical experience in the operation and maintenance of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply on forms AE6, quoting the vacancy number, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 20 Feb., 1954. (G 527)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (STATISTICS)
BATTERSEA GENERATING STATION

Some experience of power station operation desirable. Salary—Class M, Grade 15/1=£617. 8s. p.a.

ASSISTANT SHIFT CHARGE ENGINEER
ST. MARYLEBONE GENERATING STATION

Sound technical training and practical experience in Generating Station operation. Salary—Class E, Grade 9/1=£616. 7s. p.a.

GENERAL ASSISTANT ENGINEER
THAMES GRID CONTROL AREA, LONDON

Power station experience an advantage. Successful candidate must be prepared to work shift hours if required. Salary in scale, Class AX, Grade 7=£556. 10s. to £699. 6s. rising to ultimate maximum EX. 7 £785. 8s. p.a

Application may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Gt. Portland St, W.1, and be received within 14 days of this advertisement. (G 512)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the post of:

ASSISTANT SHIFT CHARGE ENGINEER
LITTLE BARFORD GENERATING STATION

Salary Class G, Grade 9, £641-£667 per annum.

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Electrical and/or Mechanical Engineering or equivalent and possess experience in the operation of Generating Stations.

Apply by 13 Feb., 1954, giving age, details of qualifications and experience to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14.

W. N. C. CLINCH,
Controller.
(G 514)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for the post of DEMONSTRATOR and HOUSECRAFT ADVISER in the Cowal Area (headquarters Dunoon). Candidates should hold a College Diploma in Domestic Science, and have ability to organise and conduct electric cooking and other demonstrations. Salary in accordance with N.J.C. Scale, Grade 1, £380 to £470. Superannuation scheme.

Application forms, which can be obtained from the Area Manager, Hamilton St, Dunoon, should be completed and returned to arrive not later than Monday, 15 Feb., 1954. (G 490)

MIDLANDS ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER required in the Walsall District of the Wolverhampton and District Sub-Area. Applicants should possess a sound technical training and have a wide practical experience of industrial, commercial and domestic installations and their electrical requirements. The duties will include advice on utilisation, negotiations with consumers, preparation of estimates, etc., planning of contracting work and maintenance of consumer service. Technical qualifications desirable. Salary £738/£771 (N.J.B. Grade F.6) Superannuable.

Apply, in writing within 14 days stating age, experience, present salary and position to Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

A. STEPHENS,
Secretary.
(G 526)

BRITISH ELECTRICITY AUTHORITY
North Western Division

VACANCY No. 16/54 — STATION SHIFT CONTROL ENGINEER, Hartshead Generating Station, Stalybridge, Ches. Salary £608/£630 (G.10).

Vacancy No. 17/54—OPERATION AND EFFICIENCY ENGINEER, Carrington Generating Station, near Manchester. Salary £885/£923 (H.5).

Application, quoting vacancy No. to Establishments Officer, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 13 Feb. (G 515)

BRITISH ELECTRICITY AUTHORITY
Southern Division

S/13.492

APPLICATIONS are invited for a position as SHIFT CONTROL ENGINEER, Earley Generating Station.

Applicants should have had a sound technical training, experience in the operation of a modern generating station and should preferably hold qualifications leading to corporate membership of a recognised professional institution.

Salary N.J.B. G/10, £608-£630.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 17 Feb., 1954. (G 528)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

DEMONSTRATOR (Female) required in the Liverpool area. Salary within the range £380/£470 p.a. (N.J.C. Grade 1).

Applicants should have a knowledge of electrical appliances and possess a Diploma in Domestic Science or other approved certificate. Previous experience in the Electricity Supply Industry advantageous.

The appointment is superannuable and subject to medical examination.

Apply by letter stating age, education and experience to the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3. Closing date: 15 Feb., 1954. (G 488)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL OFFICER required in the Northwich District. Salary £740/£774 per annum (N.J.B. Class E, Grade 5).

Applicants should have had considerable experience on the commercial side of the Electricity Supply Industry, including the operation and control of contracting work. Membership of the Institution of Electrical Engineers or similar qualification desirable.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, near Northwich, Cheshire. Closing date: 15 Feb., 1954. (G 517)

BRITISH ELECTRICITY AUTHORITY

HEADQUARTERS, London. Require a 3rd Assistant ENGINEER (Circuit Breakers) in the Transmission Design Branch. Candidates should have good experience of the design and construction of E.H.V. circuit breakers and preferably some experience of short circuit testing. Engineering and educational qualifications not below A.M.I.E.E. standard are essential.

Salary N.J.B. Grade 4, £753—£981 inclusive.

Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, to be returned by 20 Feb., 1954. Quote reference ET/442. (G 521)

BRITISH ELECTRICITY AUTHORITY
North Western Division

STATION SUPERINTENDENT required for Carlisle Generating Station. Applicants should be fully qualified engineers. An appreciation of modern concepts of administration, financial control and employee relations (including welfare, training, and joint consultation) is desirable. Salary £1,087/1134 (N.J.B. F.1).

Applications, in writing, quoting Vacancy No. 15/54 should be addressed to the Establishments Officer, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 27 Feb. (G 489)

SOUTH WALES ELECTRICITY BOARD

REQUIRED ENGINEERING DRAUGHTSMAN in the Eastern Sub-Area of the Board at Cwmbran.

Salary—Class D, Grade 6 (£433/£567) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary to arrive by 13 Feb., 1954.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (G 513)

CITY ARCHITECT'S DEPARTMENT, MANCHESTER

APPLICATIONS are invited from persons having suitable qualifications and/or experience for the appointment of ELECTRICAL ENGINEERING ASSISTANT, Salary A.P.T. Grade III, £525 to £570 per annum.

Further particulars and form of application may be obtained from the City Architect, Town Hall, Manchester 2, the completed form to be returned to the same address by 16 Feb., 1954. Canvassing is prohibited. (G 530)

YORKSHIRE ELECTRICITY BOARD
No. 2 (Huddersfield) Sub-Area

SECOND ASSISTANT ENGINEER
(SYSTEM DESIGN)

APPLICANTS must be capable of assisting the Senior Assistant Engineer in the following duties of the System Design Section:

The assessment of load growth on all existing Sub-Area networks operating at voltages up to 66 kV. On networks operating at 11 kV and below, the detailed design of reinforcements and extensions, and the preparation of relevant technical reports, the designs of substations, overhead and underground distribution circuits.

Candidates should be Corporate Members of the Institution of Electrical Engineers and should have a wide experience in the operation and design of Urban and Rural Networks.

Salary — N.J.B. Class K, Grade 7, £869/907 per annum.

SECOND ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound practical training and experience in the operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Salary — N.J.B. Class K, Grade 7, £869/907 per annum.

GENERAL ASSISTANT ENGINEER
(SYSTEM DESIGN)

Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications, and must have had practical experience of the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems. Experience in planning and estimating will be an advantage.

Salary — N.J.B. Class K, Grade 13, £585/605 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 18 Feb., 1954.

No. 5 (Wakefield) Sub-Area

THIRD ASSISTANT ENGINEER
(STREET LIGHTING)

Applicants, who should have had a good general education and be technically qualified, must be fully experienced in the application of electricity for street lighting purposes, in the preparation of estimates and in the relevant negotiations with local authorities.

Salary — N.J.B. Class K, Grade 10, £719/750 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 18 Feb., 1954.

No. 3 (Sheffield Sub-Area)

GENERAL ASSISTANT ENGINEER
(DISTRIBUTION DESIGN)

Applicants should hold at least the Higher National Certificate in Electrical Engineering and have had experience on an overhead and underground distribution system.

The successful applicant will be employed on heavy industrial, Urban and Rural planning and estimating.

Salary — N.J.B. Class N, Grade 13, £692/716 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 18 Feb., 1954. (G 516)

EASTERN ELECTRICITY BOARD
Sub-Area Headquarters, Bedford

67/53.N. THIRD ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)

THE Grade for this vacancy was printed as 2 in Jan. 28 issue. This of course should have read Grade 11.

THE ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

maintains an EMPLOYMENT REGISTER for all supervisory and executive grades of electrical engineers and technicians.

Employers wishing to make use of this *free service* should write to the General Secretary, A.S.E.E. (Dept. ET), 54 Station Rd, New Barnet, Herts. (G 37)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR ENGINEERING DRAUGHTSMAN required in the No. 1 Sub-Area Engineer's Department. Salary within the range of £567/£671 p.a. (N.J.B. Schedule "D," Grade 5).

Applicants should preferably be in possession of a Higher National Certificate, and have had experience in the preparation of drawings in connection with substation and building construction, layout of H.V. and M.V. switchgear and associated equipment, cables, etc.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3. Closing date: 15 Feb., 1954. (G 545)

APPLICATIONS are invited from young GRADUATE ENGINEERS, to embark on a career associated with POWER STATION SWITCHGEAR development and production in its various aspects. Excellent prospects to the right men. Modern factory. Superannuation Scheme. House available to married man. Applications giving full details of training and technical education to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. (G 445)

ASSISTANT INSULATION ENGINEERS: Young men possessing a Degree or Higher National Certificate in Electrical Engineering and who are interested in Insulation Work, are invited to apply for a position as ASSISTANT ENGINEER in the Technical Department of a large switchgear manufacturing company on the North-East Coast. The work includes, experimental and theoretical investigations into dielectric phenomena, stress control, corona, insulation co-ordination and new insulating materials and techniques. Experience of similar work desirable, but not essential. Starting salary according to age, qualifications and experience. Apply stating full particulars to Box 3211, Electrical Times. (G 433)

CABLE manufacturer requires a JUNIOR ENGINEER to supervise Contract work, mainly Industrial Installations. Experience in this type of work would be an advantage. Apply giving full particulars to Box No. 3215, Electrical Times. (G 447)

CHEMIST (male or female), with some knowledge of bacteriology, bio-chemistry, or the chemistry of soils or sewage, to study the effects on rivers of power station operations, required by BRITISH ELECTRICITY AUTHORITY, HEADQUARTERS. The appointment is based on London, but the work involves travelling to power station sites anywhere in the country. Salary: N.J.B. Grade 5, £558—£769, inclusive

Forms from D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, to be returned by 22 Feb., 1954. Quote reference ET/449. (G 522)

DESIGNER DRAUGHTSMAN to take charge of medium size drawing office dealing with switchgear and control gear details.

A substantial salary will be paid to a senior man with experience in electrical equipment and capable of organising the work of less experienced men. Pension scheme in operation. 5 day week and excellent working conditions.

Apply with full details of experience in confidence to Box No. 3217, Electrical Times. (G 448)

CONTROL GEAR DESIGNERS required for manufacturers in South Midlands. Applicants should have knowledge of Motor and Machine characteristics and some control gear experience. Salary depending upon qualifications. Staff pension scheme in operation. Reply giving full details of training and experience to Chief Engineer, Igranic Electric Co., Ltd., Bedford. (G 509)

DRAUGHTSMEN. Igranic Electric Company being desirous of increasing the size of its Control Gear Drawing Office invites applications for positions as senior and junior draughtsmen. Apply to Chief Engineer, Igranic Electric Co., Ltd., Bedford. (G 510)

ELECTRICAL ASSISTANT for consulting engineers. Edinburgh office. Apprenticeship in contracting essential. Drawing office experience desirable. Applicants should have or be studying for the Higher National Certificate. Reply to Box 977, Robertson and Scott, 42 Charlotte Sq, Edinburgh 2. (G 496)

ELECTRICAL ENGINEER required by large electrical contracting and engineering organisation as representative for City of Glasgow and West of Scotland. Preference given to young man with technical knowledge and qualifications and some connection with industrial, commercial and professional firms in the area. Electrical engineering or contracting apprenticeship or training an advantage. Excellent prospects for promotion to management for young man with initiative and ambition. Apply, in writing stating age, qualifications, training and experience to Box 3245. (G 504)

ELECTRICAL ENGINEER required to deal with matters relating to the use of copper and copper alloys for electrical purposes. Four-figure salary with generous superannuation to suitable man. Candidates must be Corporate Members of the Institution of Electrical Engineers, preferably with a University degree and have a sound theoretical background with good practical experience. Some experience of overhead lines an advantage. Applications stating age, details of training and experience, should be marked "Personal" and addressed to the General Manager, Copper Development Association, Kendals Hall, Radlett, Herts. (G 546)

ELECTRICAL ENGINEER required for editorial staff of the Electrical Times. Previous editorial experience unnecessary, as successful applicant will be trained, but engineering qualification is essential. Age about 25.—Apply to the Editor, The Electrical Times Ltd., Sardinia House, Sardinia St, London, W.C.2. (G 541)

ELECTRICAL ENGINEER, age 30/35, GRAD.I.E.E. or A.M.I.E.E., required for large Steelworks in Sheffield. To handle modernisation and new construction work. Must have served works apprenticeship, conversant with general steelworks practice. H.T. and L.T. equipment, distribution and cabling. Sound knowledge of AC/DC contactor control. Practical experience on steel plant and of industrial lighting desirable, but not essential. Salary according to qualifications and experience. Attractive Superannuation Scheme.—Box No. 3241, Electrical Times. (G 525)

SENIOR ELECTRICAL DESIGNER REQUIRED

experienced in design of medium and large A.C. Motors also flywheel type alternators. Knowledge of estimating costs on material and labour basis would be an advantage.

Apply stating experience and salary required to:

Reference "D,"
The Electric Construction Co., Ltd.,
Bushbury Engineering Works,
Wolverhampton.

(G 494)

JOHNSON AND PHILLIPS LTD

MANAGER OF CABLE TEST AND RESEARCH DEPARTMENT

APPLICATIONS are invited for the post of Manager of the Cable Test and Research Department. Candidates should hold a degree or its equivalent in Electrical Engineering, and should be a Corporate Member of the Institution of Electrical Engineers.

The appointment involves responsibility to the Managing Director for cable design and quality, and for all research and development work on cables.

Applicants should possess thorough experience of cable design and testing and should be familiar with current cable specifications.

Apply by letter, stating full particulars of education, qualifications and experience to: **Managing Director, Johnson and Phillips Ltd., Victoria Works, Charlton, S.E.7.** (G 493)

FOSTER TRANSFORMERS LTD., South Wimbledon, require an ASSISTANT DRAUGHTSMAN with some transformer experience. Annual bonus, in addition to generally recognised pay rates. Good working conditions in modern factory with welfare and canteen services and active sports and social club. Conveniently situated with good tube and bus services. Apply to the Personnel Officer. (G 289)

FUSEGEAR TECHNICAL REPRESENTATIVES. Immediate openings are available with THE ENGLISH ELECTRIC CO., LTD. Applicants must have a Higher National Certificate (Electrical) and practical engineering experience or training. Please write, giving full details and quoting ref. 1073B to Dept. C.P.S., 336/7 Strand, W.C.2. (G 455)

JOHNSON AND PHILLIPS LIMITED require EXPERIENCED OVERHEAD LINESMEN for E.H.T. and L.T. wood pole Contracts in Eastern Counties and other districts. Applications stating age, experience, copies of references to Employment and Welfare Manager, Messrs Johnson and Phillips Limited, Victoria Way, Charlton, S.E.7. (G 407)

LEADING electrical engineering company has vacancy for Senior lamp and lighting SALESMAN N.E. coast. Apply with full details of experience and copies of references, etc., to Box 3233. (G 506)

LINESMEN for 132 kV Transmission system required by the British Electricity Authority, South West Scotland Division. Three linesmen for Glasgow Section and three linesmen for Dumfries and Kirkcudbright Section. N.J.I.C. wages and conditions. Applications in writing to Divisional Secretary, 168 Broomhill Drive, Glasgow W.1, before 27 Feb., 1954. (G 538)

MONSANTO Chemicals Ltd. require an ELECTRICAL ENGINEER to take charge of the Electrical Section of their London Design Office. Applicants should preferably be corporate members of the Institution of Electrical Engineers, and be experienced in all technical aspects of electrical engineering as met in heavy chemical and petroleum installations—including H.T. and L.T. generation and distribution, lighting installations, rectifier plants, furnace work, etc.

Age between 30 and 40 is preferred with at least 3 years' experience in a responsible position involving similar type of work. The post is permanent and pensionable, and applications in writing should be sent to the Chief Personnel Officer, Monsanto Chemicals Ltd., 8 Waterloo Place, London, S.W.1. (G 495)

THE ARMY EMERGENCY RESERVE

ROYAL ELECTRICAL AND MECHANICAL ENGINEERS

VACANCIES

FOR QUALIFIED ENGINEERS AND SKILLED TRADESMEN IN ALL RANKS: PREVIOUS MILITARY SERVICE NOT ESSENTIAL EXCELLENT PROMOTION PROSPECTS FOR EX W.O.s AND N.C.O.s TRAINING FOR FIFTEEN DAYS ANNUALLY AT FULL ARMY RATES OF PAY AND ALLOWANCES, WITH GENEROUS

TAX-FREE BOUNTY

LIABILITY FOR RECALL ON GENERAL MOBILISATION ONLY.

VOLUNTEER

to use your skill for 2, 3 or 4 years in

BRITAIN'S RESERVE ARMY

For full particulars write to:

HQ AER REME (Sec ET)
BROXHEAD HOUSE, BORDON, HANTS

or ask at any

ARMY RECRUITING OFFICE

(G 537)

MANAGER required by large engineering Company in the North of England to take complete control of department engaged in the manufacture and sale of Centrifugal Oil Purifiers. Applicants should be technically qualified mechanical engineers, preferably with knowledge of oil technology. Apply by letter giving full details of age, qualifications, experience and salary required to—Box 3239, Electrical Times. (G 524)

M.K. ELECTRIC LTD. require a REPRESENTATIVE for the Eastern Counties. Applicants, who should be car owners, must have first-rate contacts throughout the area. Apply in strict confidence to Sales Manager, M.K. Electric Ltd., Wakefield St, London, N.18. (G 456)

SCIENTIFIC OFFICER required for the Electron Microscopy Laboratory of British Insulated Callender's Cables Ltd. at 38 Wood Lane, Shepherds Bush, W.12. Candidate should be a graduate in Physics and have some experience of vacuum technique. Some knowledge of photography and electronics is desirable. Candidates must have a good eye for fine work and a steady hand. 5-day week. Pension Fund. Apply in writing to Staff Officer, British Insulated Callender's Cables Ltd., 21 Bloomsbury St, London, W.C.1. (G 499)

SHIFT CHARGE ENGINEER for Electricity Supply Undertaking in Bagdad. Applications are invited from suitably qualified Engineers, preferably between 25 and 35 years of age, who have had experience in the operation of a power station of at least 15,000 kW, with medium pressure boilers. Salary £1,000 to £1,200 per annum, plus high cost of living allowance. Free house with heavy furniture will be supplied or a monthly house allowance of £12, in lieu.

Three year contract, renewable, with first class passage each way for successful applicant and family (if married). Three months' leave on full pay in U.K. on completion of 24 consecutive months in Iraq, first class leave passages being paid. (G 498)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

SOUTH WESTERN ELECTRICITY BOARD, Bath District, require FITTER (Electrical) experienced in the erection and maintenance of switchgear, up to 33 kV. Conditions and Wages in accordance with N.J.I.C. Supply Agreement. Detailed applications within 10 days to District Manager, Electricity House, Old Bridge, Bath. (G 497)

SURVEYOR required, conversant with Surveying and Profiling Overhead Line Routes. Good wages and subsistence paid. Inverness, Elgin Area. Apply: B. French Ltd., Pike Mills, Green St, Kidderminster. (G 547)

SWITCHGEAR DRAUGHTSMAN required with experience in Extra High Tension Outdoor Switchgear and/or 11 kV Oil-immersed Metalclad Switchgear up to 250 mVA. Write giving details of age, experience, qualifications and salary required to Box 3237. (G 508)

TRANSFORMER DRAUGHTSMAN, age 30/40 years, required to take charge of Drawing Office. Experience in Transformers to 4,000 kVA 33 kV essential. Must be able to control staff and a good organiser. Pension scheme available. Apply giving details, education, experience, salary to Lindley Thompson Transformer Co., St. Mary's Rd, Slough. (G 500)

THE Associated Ethyl Company Limited, Northwich, Cheshire, has vacancies in the drawing office of their Engineering Department for ELECTRICAL DESIGNER DRAUGHTSMEN. Applicants should be between 25 and 30 years of age, have served an engineering apprenticeship and preferably obtained a Higher National Certificate or currently studying for same. Preference will be given to applicants who are experienced in the design and layout of electrical distribution and utilisation work as practised in either chemical or petroleum processes.

Consideration will be given to applicants between 21 and 25 years of age who have served an engineering apprenticeship, preferably in the heavy chemical or petroleum industry, for the position of trainee draughtsmen.

Technical education should be equivalent to the standard required for the Higher National Certificate, but applicants holding the Ordinary National Certificate will be considered.

Successful candidates, will for a period of two to three months be based at Northwich, after which they will be transferred to the Company's new establishment at Ellesmere Port.

Starting salary will be offered commensurate with age, qualifications and experience. Applications should be addressed to the Personnel Manager at the above address. (G 536)

THE Civil Service Board of the States of Jersey invites applications for the post of ELECTRICAL AND MECHANICAL ENGINEER (unestablished). Duties include operation and maintenance of all electrical and mechanical equipment associated with main drainage scheme when completed. This will comprise generating station of 1,000 kW output, operated by dual fuel engines, automatic electrically operated pumping stations, sewage treatment machinery, refuse handling and processing machinery, air compressors, producer gas plant, civil engineering plant and vehicles and workshops. The Engineer will be required to supervise installation of equipment by manufacturers and carry out acceptance tests, etc. Applicants should have sound practical experience in responsible position covering as wide a field as possible in relation to above duties; training and experience in design and specification, particularly in electrical field, will be an advantage. Ability in organisation and control of staff essential. Salary on scale £700 by £25 to £900. Commencement of duties as soon as possible after appointment. Applications, giving full details of age, qualifications, training and experience, together with copies of two recent testimonials, should reach the Greffier of the States, States' Greffe, Jersey, by 27 Feb., 1954. (G 535)

TRANSFORMER DRAUGHTSMAN with experience on units in the range 500 to 10,000 kVA.
Apply:
Technical Director,
BRYCE ELECTRIC CONSTRUCTION CO., LTD.,
Kelvin Works, Hackbridge, Surrey. (G 440)

SWITCHGEAR DESIGN ENGINEER required. Applicants should have a good theoretical and practical knowledge of Extra High Tension Air-Break Switchgear, including Spring, Motor and Pneumatic Operating Mechanisms, and/or Oil-immersed Metalclad Indoor Switchgear, ratings up to 250 mVA at 11 kV. Write giving details of age, experience, qualifications and salary required to Box 3235. (G 507)

TRAVELLING REPRESENTATIVE required to service and install simple electrical apparatus throughout country. Must be practising Christian, single, with basic electrical knowledge. Write with full particulars to "P," c/o J. E. May Ltd., Advt. Agents, 19 Ludgate Hill, London, E.C.4. (G 396)

VACANCY FOR FRACTIONAL HORSE POWER MOTOR DESIGNER. A long established firm of manufacturing Electrical Engineers have an opening for a Development and Design Engineer to take full responsibility for the mechanical and electrical design of a wide range of fractional H.P. motors. Applicants should have University Degree or Higher National qualification in appropriate subjects and be skilled and experienced in the most modern practices for machines of this type. They should be progressive in the origination and development of new ideas and have drive and initiative. Generous salary offered with excellent working conditions and Superannuation Scheme. Please send full details and salary required to Box 3247. (G 505)

WANTED by firm of electrical and mechanical engineers in North of England, MANAGER for their Installation Department. The man selected must be capable of designing, estimating, and supervising all types of large electrical installations, must have had considerable experience in the trade. Applicants please give details of past experience and salary required.—Box No. 3225. (G 463)

APPOINTMENTS WANTED

ADVERTISER, 30 years Electrical Industry. At present Asst. Comm. Officer Electricity Authority in charge contracting section—needs change. Maintenance factory, institution, etc. Full charge. Box No. 3231, Electrical Times. (G 479)

PARIS, ENGLISH, ELEC ENGINEER seeks full or part-time post, advertising, agency, or liaison.—Box No. 3243, Electrical Times. (G 548)

WANTED

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling.—Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (G 2)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. (G 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (G 1)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (G 6)

WORK WANTED

ABOUT guaranteed rewinds to the trade. Armatures, Fields, Stators and Transformers, fractional to 25 h.p. 24 hour postal service on vac and drill windings. Cleaners rebuilt, sprayed and recovered as new. Guaranteed results. Give us a trial and send sample machine, if dissatisfied no charge made. All spares carried in stock. Every machine subjected to 1,000 volt flash test before leaving our modern factory. Repetition work at special rates, all quotations free. Neptric Ltd., 73/79 Hurst St, Birmingham 5. Midland 4041/2/3. Branches in most provincial towns. (G 432)

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (G 13)

ALL types Motors, Drills, Vacuum Cleaners, etc., efficiently REPAIRED or REWOUND at competitive prices. Repetition work a speciality. Quotations invited. Kingsmill Electrical, Locking Rd, Weston-super-Mare. (Telephone: W-s-M 2473.) (G 303)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95, Park Lane, Leeds, 1. (G 20)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (G 17)

FOR SALE

SOUTH WEST SCOTLAND ELECTRICITY BOARD
Clyde Sub-Area

The undermentioned Metropolitan-Vickers L.T. Oil Switches for 440 volt 3-phase system, are "For Sale as They Stand":

Lot No.	*Quantity*	*Type*	*Description*
89	4	1,000 B.B.O.	3 Ammeters and 3 current transformers
	9	1,200 B.L.	3 Ammeters and 3 current transformers
	3	1,500 B.L.	3 Ammeters and 3 current transformers
90	2	1,200 B.L.	3 Ammeters and 3 current transformers
	6	1,500 B.L.	Without Ammeters and current transformers
91	2	1,500 B.L.	3 Ammeters and 3 current transformers (at Ranfurly)

Particulars as to where these switches are located and arrangements for viewing may be had from 206 St. Vincent St, Glasgow C.2, with whom offers should be lodged by Wednesday, 24 Feb., 1954. (G 540)

A.C.-D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London N.W.4. (G 5)

FLAMEPROOF MOTORS, M.G. SETS D.C. MOTORS, GEARED MOTORS, A.C MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS
ELECTROPOWER COMPANY LIMITED
Kingsbury Works, Kingsbury Rd, London, N.W 9
Tel: COLindale 4621/3,
Grams: Lektropowa, Hyde, London (G12p)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel.: Forest Hill 7089. (G 18)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chi 5105, 67 Rothschild Rd, W.4. (G 7)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (G 3)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (G 9)

ALTERNATORS, 665 kVA, 500 kW, revolving field ALTERNATOR by Siemens. Type 819 UR, for 5,000/3/50. Open type with bell shields, underslung yoke, direct coupled Exciter 250 V. Speed 333 r.p.m.

625 kVA, revolving field ALTERNATOR by E.E.C. for 440/3/50, 4 wire supply, with direct coupled Exciter 17·5 kW 50 V. Speed 600 r.p.m.

600 kVA, 480 kW, revolving field ALTERNATOR by E.E.C. for 400/3/50, with direct coupled Exciter Generator. Speed 600 r.p.m.

385 kVA, 308 kW, revolving field ALTERNATOR by L.D.M. for 400/3/50, 0·8 p.f., open type with direct coupled Exciter. Speed 600 r.p.m.

350 kVA, revolving field ALTERNATOR by Mather and Platt, for 400/3/50, 0·8 p.f. Open type with direct coupled Exciter. Speed 750 r.p.m.

George Cohen, Sons and Co., Ltd., Wood Lane, London, W.12. Tel.: Shepherds Bush 2070 and Stanningley, nr. Leeds. Tel.: Pudsey 2241. (G 476)

CARBON LAMPS. Ediswan, Osram, 240 V, 16 C.P., doz. 36s.; 220 V, 50 C.P. 200 W, 42s.; also 110 V ditto. Suplex Lamps Ltd., 239 High Holborn, London, W.C.1. (G 539)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (G 21)

GUARANTEED NEW, boxed, not ex Government, Crompton Parkinson ¼ h.p. MOTORS. 200 to 250 v., 50 cycle, £4 each, carriage extra. 338 Central Drive, Blackpool. Phone 24748. (G 501)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (G10)

INDUSTRIAL ELECTRIC MOTORS, ¼ h.p. English Electric Single-Phase Split-Phase, 230/250 V, 50 cycles, 1,440 r.p.m. Also large range of well-known makes from 1-6 h.p., varied voltages, majority 1,440 r.p.m. All brand new at reduced prices. For comprehensive lists apply to Tecalemit Ltd., Great West Rd, Brentford, Middlesex. Ref. QFO/OJB. (G 423)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW. 7221. (G 11)

NO. 7 PRIOR STOKER, fully automatic. Good condition.

Higgs motor, single phase, 460 V with starter, condenser and pulley, Mains Transformer, new, 1 kVA. Primary Volts 230 secondary Volts 50. Secretary, Hospital, Scorton, Yorks. (G 408)

NEW and unused Barlow and Whitney ELECTRIC OVENS, 415 V., 3 Ph, 4 wire, 40 kW, max. temp. 250°C, complete with recording, process timing and control cabinets, inside measurements 8 ft 6 in. d., 7 ft 3 in. w., 6 ft 5 in. h., offered at less than half cost price. Woodfield and Turner, Bankfield Mill, Burnley. Tel. 3065. (G 502)

CHEAP! ODD LENGTH COILS CABLE AND FLEX

No coil under 20 yds in length. All prices for a 100 yd lot. Everything guaranteed.

	3/029	3/029 W/E	7/029	7/029 W/E	7/044	1/044
Twin Flat						
T.R.S.	49/-	59/-	83/-	101/-	156/-	39/-
PLASTIC	52/-	64/-	84/-	110/-	166/-	36/-
V.I.R. Single	21/-	—	34/-	—	66/-	17/-

FLEX. Plastic T.T. or flat 13/9. Maroon T.T. 24/-. Maroon in 10-20 yd. Coils 20/-. Twin Circ p. and b. 42/-; 3-core p. and b. 72/-. Less than 100 yd lot of anything supplied, just add 5% Add part carriage to small orders please. Full lists of every other type on request.

British Distributing Co., 591 Green Lanes, London, N.8. MOU 0055/6
(G 309p)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (G 14)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery. Lists from: J. W. Hughes, 3 St. Thomas' St, London Bridge, S.E.1. (Tel.: HOP 2759.) (G 474)

BUSINESS OPPORTUNITIES

Manufacturers with world-wide Distributing Organisation and Reputation require Manufacturing and/or Marketing Rights for additional Lines.

Products mainly of interest to the Hardware, Building, Electrical and Engineering Trades preferred.

Replies, which will be treated as strictly confidential, should be addressed in the first instance to:

RUMBLE, CROWTHER & NICHOLAS, LTD. 184, Strand, London, W.C.2
(G 383p)

A WELL-KNOWN firm of elec. and mech. engineers would share their London Office House with Showrooms, in the best West End position, with provincial makers seeking such facilities. Also excellent possibility of London or Export representation for suitable products fitting into existing organisation. Write Box 5156, Frost-Smith Advg., 64 Finsbury Pavement, London, E.C.2. (G 511)

MISCELLANEOUS

CITY AND GUILDS (Electrical, etc.) on "No Pass—No Fee" terms. Over 95 per cent. successes.—For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook FREE and post free.—B.I.E.T. (Dept. 39), 29 Wright's Lane, London, W.8. (G 15)

FREE! Brochure giving details of courses in Electrical Engineering and Electronics, covering A.M.Brit.I.R.E., City and Guilds, etc. Train with the Postal Training College operated by an Industrial Organisation. Moderate fees. E.M.I. Institutes, Postal Division, Dept. ET29, 43 Grove Park Rd, London, W.4. (G 278)

THE Proprietor of Patent No. 602625 for "*Improvements in or relating to Devices for the Selective Opening of Electric Circuit-breakers Protecting Installations*," desires to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake and Co., 28 Southampton Buildings, Chancery Lane, London, W.C.2. (G 503)

MINERVA

ELECTRICAL INSULATING VARNISHES

STOVING VARNISHES (NATURAL RESIN TYPE)

STOVING VARNISHES (SYNTHETIC RESIN TYPE)

THERMO-SETTING VARNISHES

AIR-DRYING VARNISHES

CLOTH VARNISHES

CORE-PLATE VARNISHES (STOVING AND AIR-DRYING)

COPPER-WIRE ENAMELS (OLEO-RESINOUS AND SYNTHETIC TYPES)

All the above are supplied in black and clear.

ACID AND HEAT RESISTING ENAMELS (AVAILABLE IN ALL COLOURS)

MICA BONDING VARNISHES

COIL STICKING VARNISHES

SLEEVING VARNISHES (BLACK, CLEAR AND COLOURS)

CABLE LACQUERS (NON-FLAM., CELLULOSE TYPE AND P.V.C.)

COMPOUNDS (VARIOUS TYPES)

All the materials listed conform to B.S. Specifications wherever applicable.

Our Insulating Varnish Department includes research and testing laboratories; the service of specialists is available to any manufacturer or engineer concerned with problems of insulating materials and their application.

PINCHIN JOHNSON & CO.

4 CARLTON GARDENS, LONDON, S.W.1. Tel.: TRA 5600

علاج الصدمة الكهربائية

TREATMENT FOR ELECTRIC SHOCK

To meet special demands the ELECTRICAL TIMES has now produced a "Treatment for Apparent Death from Electric Shock" wallchart with instructions printed in both ENGLISH and ARABIC.
Mounted on metal, size 17" × 11", varnished, corded and eyeletted.

Quotations for other languages on application.

THE ELECTRICAL TIMES LTD.

Sardinia House · Sardinia Street · London · W.C.2

INDEX TO ADVERTISERS

Auchterlonie, Chas., & Co., Ltd. ... 62

Belling & Co., Ltd. 4
Bill Switchgear Ltd. 3
Bridgens, Arthur, Ltd. 60
British Driver-Harris Co., Ltd.... ... 51
British Electric Resistance Co., Ltd. ... 22
British Insulated Callender's Cables, Ltd. ... ... Cover (i)
British National Electrics Ltd. 21
British Thomson-Houston Co., Ltd. ... 33
Brook Motors Ltd. 19
Brush Electrical Engineering Co., Ltd. 34, 52
Burgess Products Co., Ltd. 50

Carter, B. & F., & Co., Ltd. 60
Cayson Electrics Ltd. 62
Chance Brothers 6
Chloride Batteries Ltd. 29
Connollys (Blackley) Ltd. 14
Coughtrie, J. & G., Ltd. 65
Crabtree, J. A., & Co., Ltd. 38
Critchley Bros. Ltd. 56
Crompton Parkinson Ltd. 24

De La Rue, Thomas, & Co., Ltd. ... 59
"Diamond H" Switches Ltd. 10
Dorman & Smith Ltd. 56
Drake & Gorham Wholesale Ltd. ... 60
Ductube Co., Ltd. 31

Electrical Times Ltd. 47
Elliott Bros. (London), Ltd. 20
Enfield Cables Ltd. 57

Engineering & Lighting Equipment Co., Ltd. 55
English Electric Co., Ltd. 9
Enthoven Solders Ltd. 5
Everett Edgcumbe Ltd. 32

Ferranti Ltd. 17
Ferranti, Denis, & Co., Ltd. ... *Cover* (iii)
Fluxite Ltd. 60

Geipel, Wm., Ltd. 64
General Electric Co., Ltd. ... 13, 28, 53
Genristo Ltd. 64
Gilflex Conduits Ltd. 58
Glover, W. T., & Co., Ltd. 66

Hardy & Padmore Ltd. 62
Heayberd, F. C., & Co., Ltd. 48
Henley's W. T. Telegraph Works Co., Ltd. 39
Hick Hargreaves & Co., Ltd. ... *Cover* (iv)
Hoover Ltd. 36
Horstmann Gear Co., Ltd. 50

Imperial Chemical Industries Ltd. ... 8

Johnson & Phillips Ltd. ... *Cover* (ii)

Kautex Ltd. 26
Kelly, John, & Son 64
Key Engineering Co., Ltd. 62

Laurence, Scott & Electromotors Ltd.... 1
Lighting Glass Manufacturers' Association 2
Lindley Thompson Transformer & Service Co., Ltd. 23
Loheat Ltd. 64
L.P.S. Electrical Co., Ltd. 18

Mersey Cable Works Ltd. 63
Meritus (Barnet) Ltd. 56
Metafiltration Co., Ltd. 10
Metropolitan-Vickers Electrical Co., Ltd. 35, 40
Midland Electric Manufacturing Co., Ltd. 49
Mitchell Engineering Ltd. 37
M.K. Electric Ltd. 16
M.T.E. Control Gear Ltd. 54

Nettle Accessories Ltd. 54

Philips Electrical Ltd. 7
Pinchin Johnson & Co. 47
Premier Cooler & Engineering Co., Ltd. 6

Revo Electric Co., Ltd. 25
Rotunda Ltd. 30

Sanders, Wm., & Co. (Wednesbury), Ltd. 61
Scemco Ltd. 52
Scott, Hugh J., & Co. (Belfast), Ltd. ... 15
Simmonds & Stokes (Niphan) Ltd. ... 58
Simon-Carves Ltd. 27
Solenoids & Regulators Ltd. 22
Sperryn & Co., Ltd. 30
Statter, J. G., & Co., Ltd. 56

Taylor Tunnicliff Ltd. 11
Transformer & Electrical Co., Ltd. ... 58

United Ebonite & Lorival Ltd.... ... 12
U.S. Metallic Packing Co., Ltd. ... 22

West Insulating Co., Ltd. 58
Wootton & Co., Ltd. 18

Zenith Electric Co., Ltd. 26

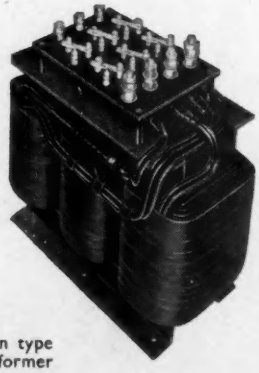
TRANSFORMERS

From 8 VA to 100 kVA

HEAYBERD Transformers are designed to give the utmost reliability and economy in operation, fully in accordance with the relevant British Standard Specifications.
We shall be pleased to quote for open, and enclosed transformers to suit your particular purpose. Also C.S.A. approved Transformers.

WRITE FOR LIST 1054

A 250 VA Power Transformer enclosed in a wall mounting case.

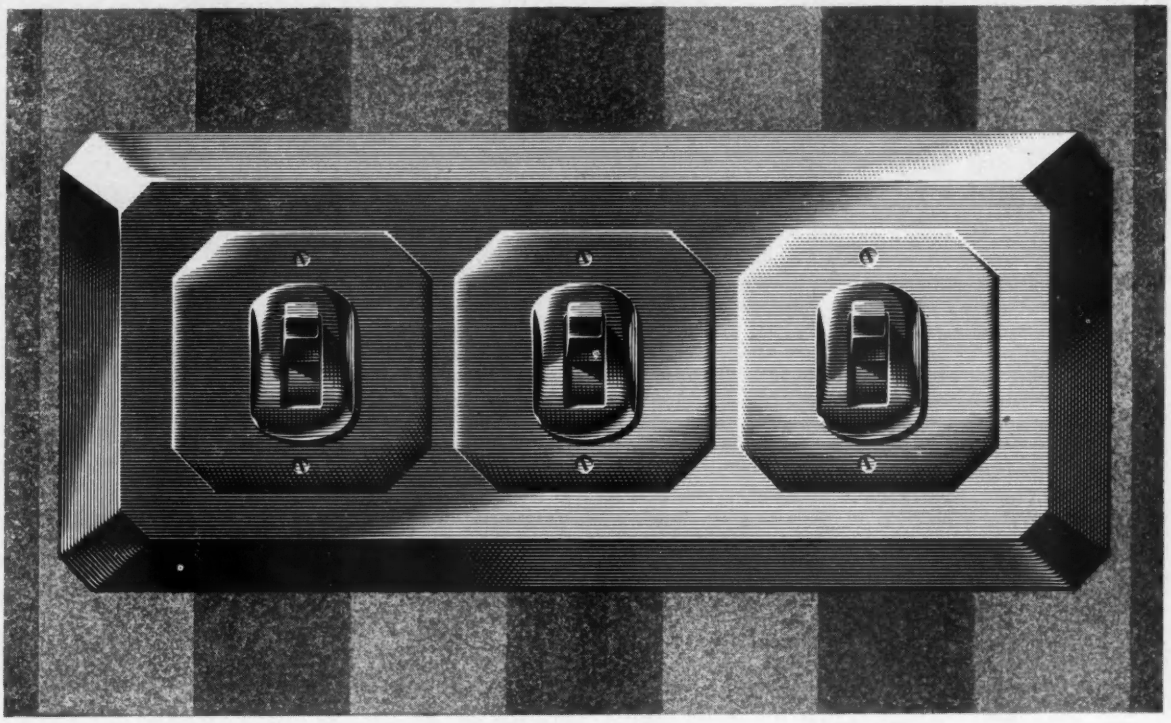


A typical open type 3-phase transformer

HEAYBERD

F. C. HEAYBERD & CO. LTD *Head Office :* **GREENWICH SOUTH STREET, S.E.10.**
Phone : TIDeway 4646 (3 lines)
Works: Greenwich. Cables & Grams: "Heayberd, Green, London"

Good wiring deserves MEM *tumbler switches*



Put the modern well designed touch to a wiring scheme—satisfy architect and user with good looks and good taste and, most of all, know for yourself that here is a robust simple mechanism that will last for a lifetime. You can do all these by choosing MEM tumbler switches for your next wiring job.

Send for list No. 341 for full details of the range—5 amps., 250 volts, one and two-way, surface, semi-recessed and flush mounting also flush plates and wood and iron boxes.

MEM

Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD., BIRMINGHAM 11

Branches in London and Manchester

BURGESS

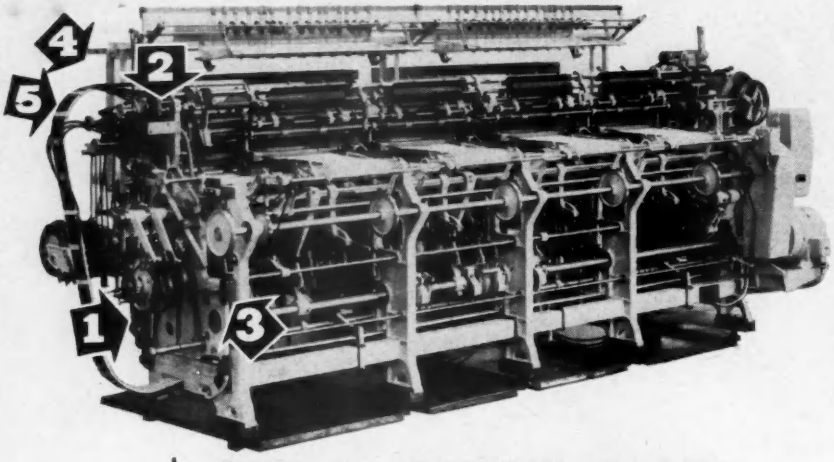
MICRO-SWITCHES

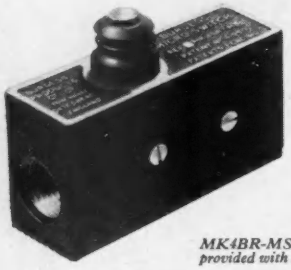
Industry's Automatic Choice

BURGESS MK4BR-MS MICRO-SWITCHES control the safe operation of this world-famous full-fashioned machine. It is typical of the many efficient and reliable textile machines used in the knitting trade—and, indeed, in all branches of the industry—which use Burgess Micro-Switches. If you have an application for precision-made, snap-action Switches, we shall be happy to help you. As a first step please write for Catalogue No. 50/28.

The switches that have been chosen for the Mellor Bromley "Twin Knitter" Full Fashioned Hose Machine

1. For Chain Drum Safety.
2. Narrowing Spindle Safety Switch.
3. For Slow Speed Selection.
4. } Two Micro-Switches located at
5. } Rear are for Splicing and Carrier Spindle Safety.





MK4BR-MS, a Metalclad model provided with conduit entry.

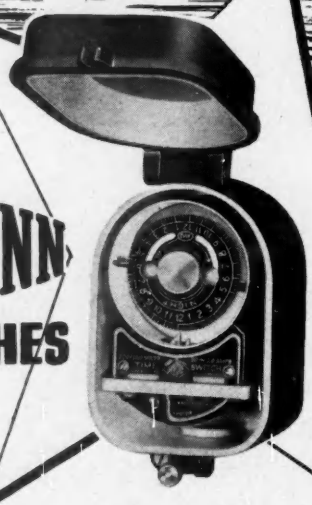
BURGESS PRODUCTS CO. LTD.

Micro-Switch Division

Dukes Way, Team Valley, Gateshead 11.

Telephone: Low Fell 75322 (3 lines).

Stars of the lighting world



HORSTMANN TIME SWITCHES

'Type "V"'

The comprehensive range covers hand wound models (15, 21 & 40 day run), electrically wound models and synchronous models with or without spring reserve, as required. Models are available for public lighting, off peak tariff and shop window lighting control, etc., etc.

Many years of experience in the design and manufacture of automatic lighting appliances ensures that HORSTMANN TIME SWITCHES meet the exacting demands of modern lighting control.

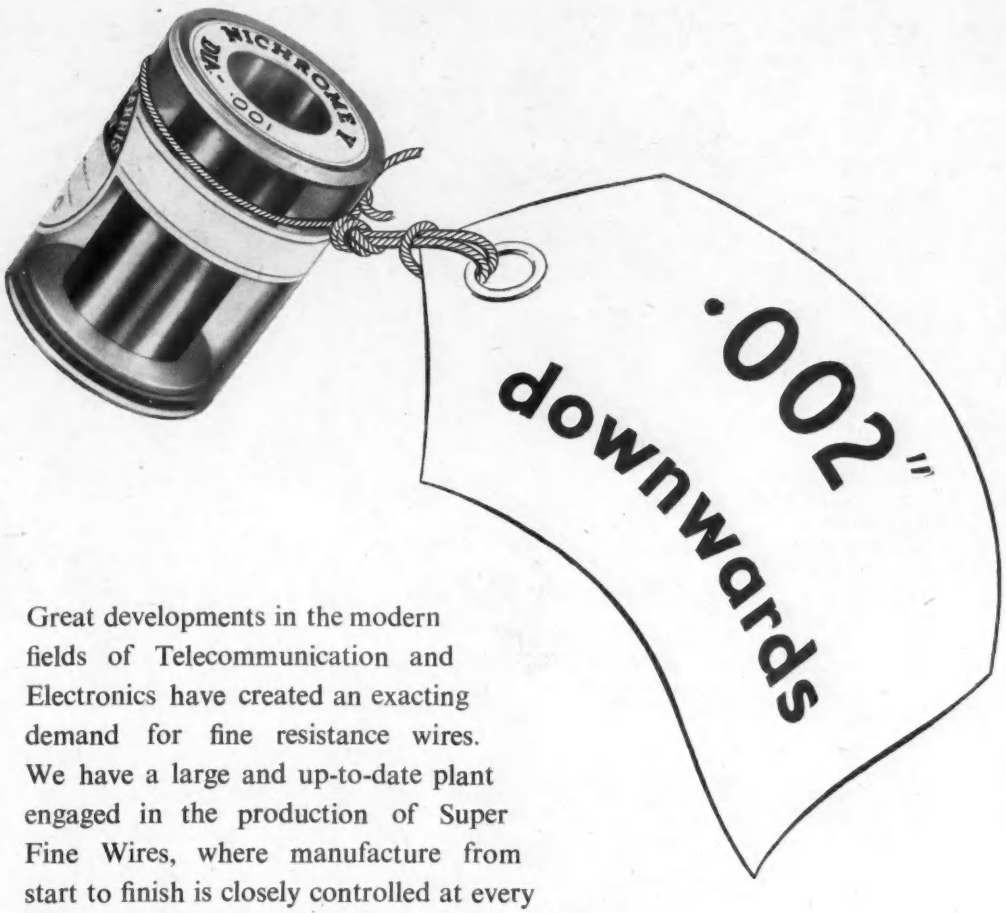
The illustrations show the type "V" 20 amp. and the type "Y" 20 amp. switches. The latter is electrically wound and incorporates a spring reserve. Its compact size makes it particularly suitable for use in the base of lamp columns where space is limited.

'Type "Y"'

THE HORSTMANN GEAR CO. LTD.

NEWBRIDGE WORKS · BATH · ENGLAND TEL: 7241

SUPER FINE WIRE



Great developments in the modern fields of Telecommunication and Electronics have created an exacting demand for fine resistance wires. We have a large and up-to-date plant engaged in the production of Super Fine Wires, where manufacture from start to finish is closely controlled at every stage. We supply Super Fine Wires in all our resistance alloys, notably "Nichrome V," "Nichrome," "Karma" and "Advance," in sizes from ·002 in. (0·05 m/m) downwards.

BRITISH DRIVER-HARRIS CO. LTD

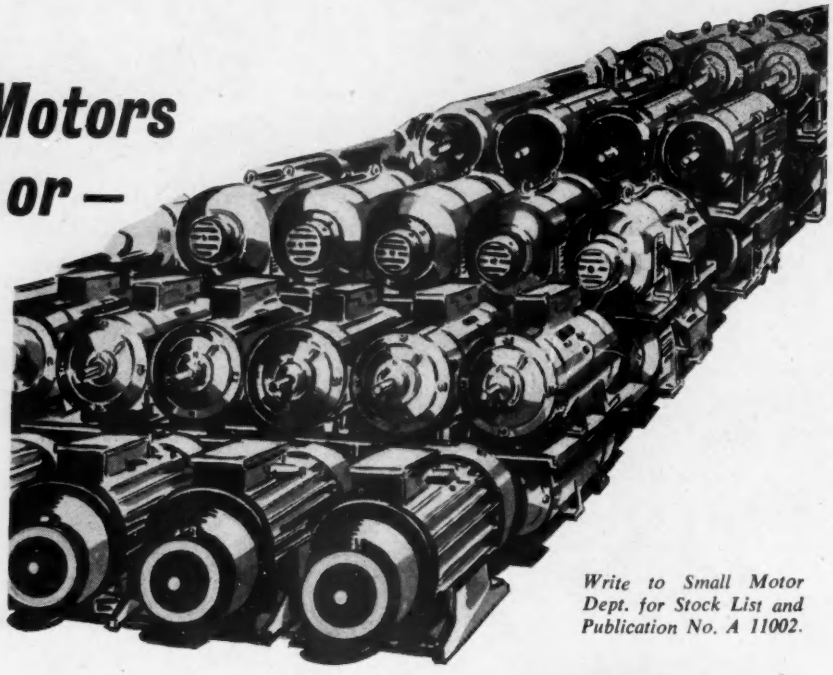
MANCHESTER 15

Nickel and Nickel Alloy Specialists :—for furnace elements, domestic appliances, thermo-couples, telecommunications, lamps, spark plugs, fine wires, etc.

"NICHROME"
REGISTERED TRADE MARK

F

small Motors from stock or –



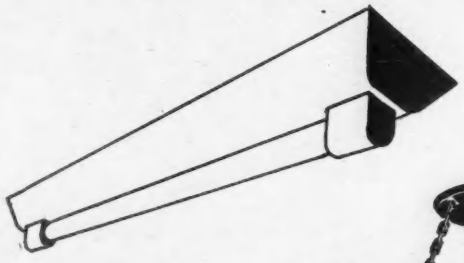
— delivered within a short period from receipt of order. This new service is now available from our Cardiff Works for motors from 1 to 80 b.h.p. These motors are supplied with slip ring or squirrel cage rotors, and carry the guarantee of high quality associated with all BRUSH products. Suitable for driving fan and pumping sets, compressors, machine tools, conveyor belts, quarry equipment, paint mixers, grinding mills, textile machinery and similar industrial applications.

Write to Small Motor Dept. for Stock List and Publication No. A 11002.

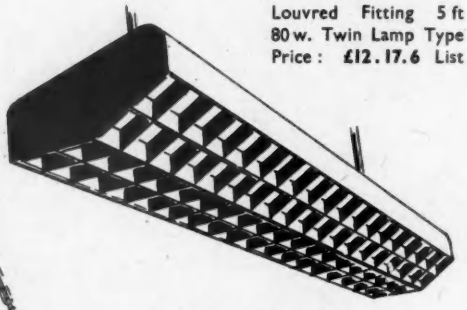
Small motors by BRUSH

B5/1 THE BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF, GREAT BRITAIN

No Greater Value at any Price!



The "DL RED SPOT"
Batten Fitting.
Price :
5 ft 80 w. **£4.7.6** List
4 ft 40 w. **£3.17.6** List



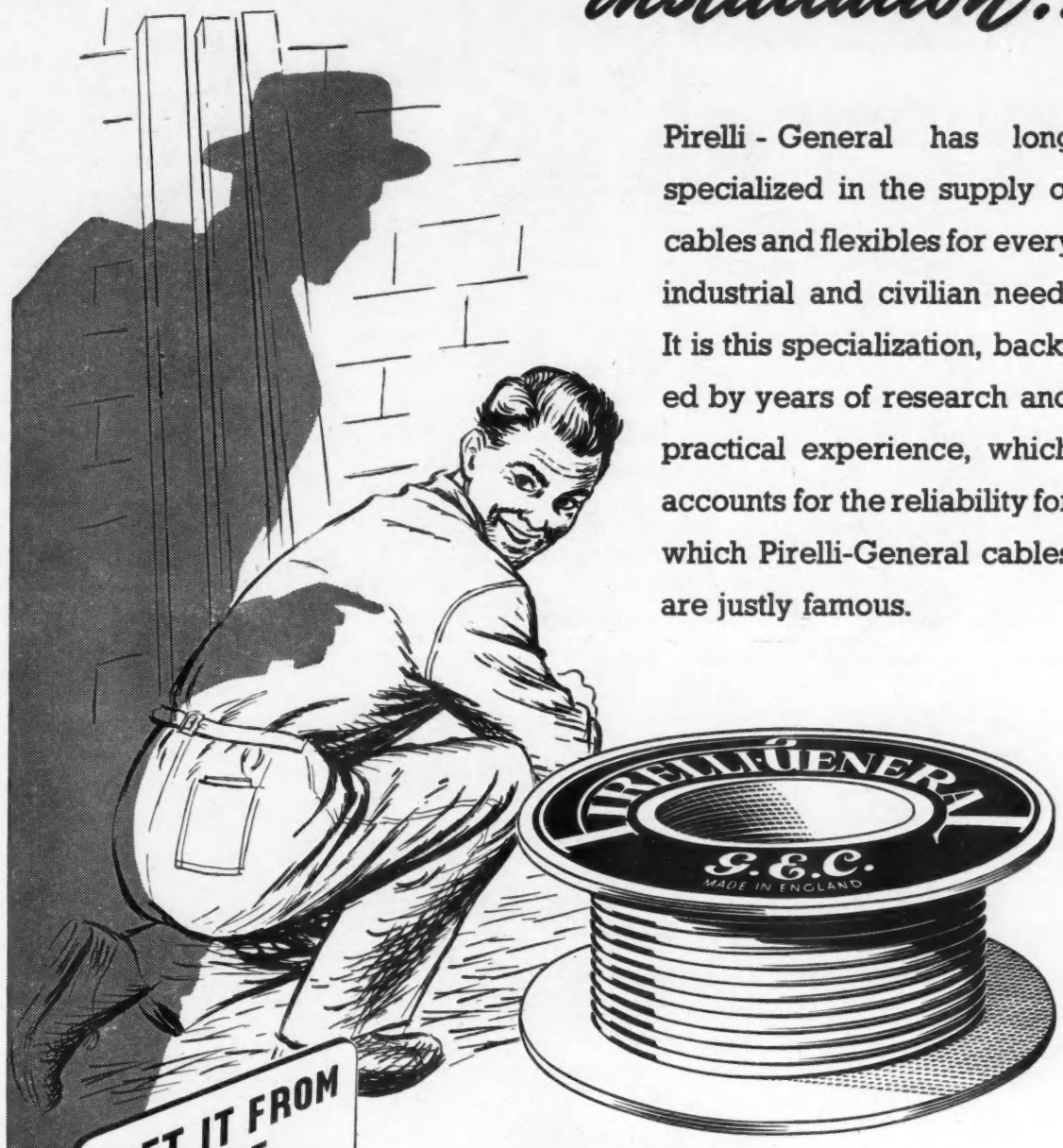
The "SCEMCO 51"
Louvred Fitting 5 ft
80 w. Twin Lamp Type
Price : **£12.17.6** List

The "STANDARD"
Circular 80 w. in White or Colour to requirements.
Price : **£4.7.9** List

FLUORESCENT LAMPS EXTRA

SCEMCO OF SOHO ST. LONDON W.1
TELEPHONE : GERRARD 1461

Another SAFE and SURE installation...



Pirelli - General has long specialized in the supply of cables and flexibles for every industrial and civilian need. It is this specialization, backed by years of research and practical experience, which accounts for the reliability for which Pirelli-General cables are justly famous.

GET IT FROM THE G.E.C.

PIRELLI-GENERAL cables

THE GENERAL ELECTRIC CO LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

M·T·E

AUTOMATIC CONTROL EQUIPMENT

—'Built-in', 'Built-on', or 'Separately-mounted' for simple starting, stopping, and speed changing, or for complicated sequence operations. Can be supplied for single- or multi-motor control, and for embodying in industrial machinery of all types.

THIS EQUIPMENT WILL BE DEMONSTRATED AT THE ELECTRICAL ENGINEERS EXHIBITION (A.S.E.E.) EARL'S COURT.

M.T.E. CONTROL GEAR LIMITED

LEIGH-ON-SEA, ESSEX

Telephone: LEIGH-ON-SEA 77224 (3 lines). Telegrams: "ELECTRICS, LEIGH-ON-SEA"

Midlands Branch Office: 47 WARWICK ROAD, COVENTRY. Telephone: Coventry 64561

Is Yours to Hand?

-if not, write NOW

★ These are three recent Nettle publications, a leaflet describing the new weather-proof rubber batten socket and plug, the Coronation issue of our comprehensive catalogue and a new price list.

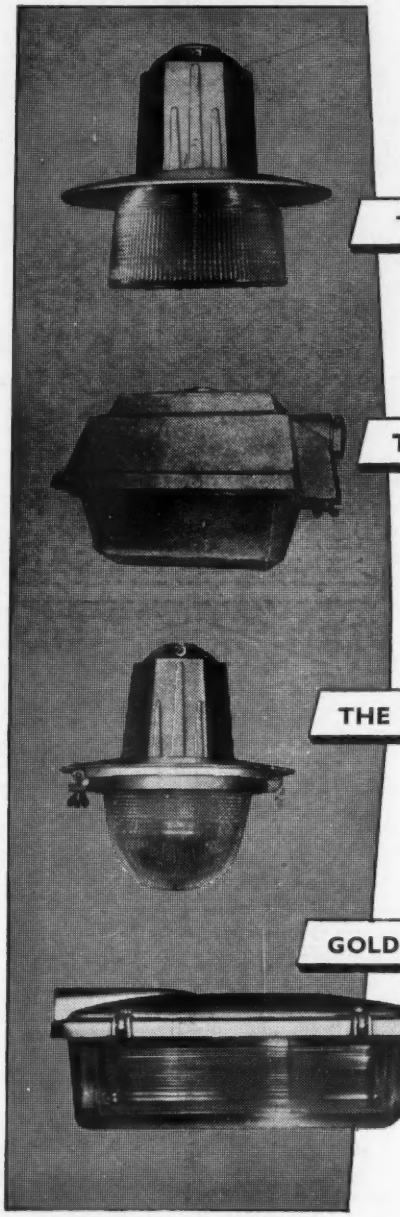
Requests for these and all other Nettle publications will receive prompt attention. Your enquiries are invited.

NETTLE ACCESSORIES Ltd

HARPER RD. WYTHENSHAWE MANCHESTER

Improve Your street lighting

These fittings make all the difference!



These four fittings from the ELECO range of street lighting lanterns embody all the latest improvements as recommended in B.S. Specification 1788 for lantern construction.

THE WELWYN lantern has been re-styled and the refractor springs are totally enclosed to give complete protection against all weather conditions, also giving the interior of the fitting a clean appearance.

THE LANCASTER lantern is a controlled cut-off fitting which reduces glare to a minimum. The distribution from the horizontal Mercury discharge lamp in the upper half of the fitting is reflected by means of specially designed reflectors through the scientifically designed refractor bowl giving high and even illumination on the road surface.

THE LETCHWORTH lantern incorporates a 12″ diameter reflector and two pairs of focal positioning stops. The bowl type refractor is designed for use with gas-filled lamps from 100W to 200W and combines maximum light control, with the highest possible efficiency. The joint between the refractor, refractor ring and body casting is rendered dust-proof by the use of thick white felt gaskets.

GOLDEN RAY MK. III lantern is completely dustproof and is available for all sizes of sodium discharge lamps. The "Perspex" refractor plates have machined "Perspex" prisms sealed by a special process to the interior of the outer enclosing "Perspex" bowl and because of the unique dustproof qualities of this fitting, maintenance costs are reduced to a minimum.

ELECO

Engineering & Lighting Equipment Co. Ltd

SPHERE WORKS, ST. ALBANS, HERTS.

Telegrams: VOLTARCON, ST. ALBANS. *Telephone:* ST. ALBANS 2258/2259

DORMAN TS FUSED SWITCH

"ELEGANCE WITH EFFICIENCY"

500 V UP TO 300 A AC OR DC

THIS RANGE OF SWITCHGEAR INCORPORATES THE BEST MODERN PRACTICE & DESIGN

- ★ H.R.C. FUSES FOR CATEGORY DUTY AC 5 OR DC 4
- ★ SILVER FACED CONTACTS HIGH PRESSURE BUTT TYPE
- ★ QUICK DOUBLE BREAK ACTION
- ★ REMARKABLE WIRING SPACE CUTS FITTING COSTS
- ★ SPACE SAVING
- ★ OWING TO THE DESIGN & FRONT OPERATION; UNITS MAY BE MOUNTED UP TO EACH OTHER WHEN MOUNTING ON BUS-BAR CHAMBER THUS REDUCING LENGTH—JUST THE JOB FOR CONFINED SPACES

AND ALL AT REMARKABLY COMPETITIVE PRICES

WRITE FOR BOOKLET TSS/1

DORMAN & SMITH LTD.

MANCHESTER • 5

EXPORT ENQUIRIES TO: DORMAN & SMITH LTD., 10 EMERALD STREET, LONDON, W.C.1

Plastic Identification Labels

distinctive, durable, in various colours

Engraved or plain, there is a Critchley label for almost every identifying purpose in the electrical industry. Neat and clear in appearance, they are supplied complete with self-tapping screws. Available in a range of colours.

Standard Sizes:

3½″ x 2″	2½″ x 1½″	2″ x 1⅛″
4″ x 2⅜″	3″ x 1¾″	1½″ x ¾″

SAMPLES AND PRICE LIST ON REQUEST

Critchley Bros. Ltd., Brimscombe, Stroud, Glos.

Telephone: Brimscombe 2208

MERITUS

INDUSTRIAL LIGHTING BRACKETS

Robust Construction both Electrically and Mechanically for

WORK BENCHES, LABORATORIES MACHINE LIGHTS, GARAGES, ETC.

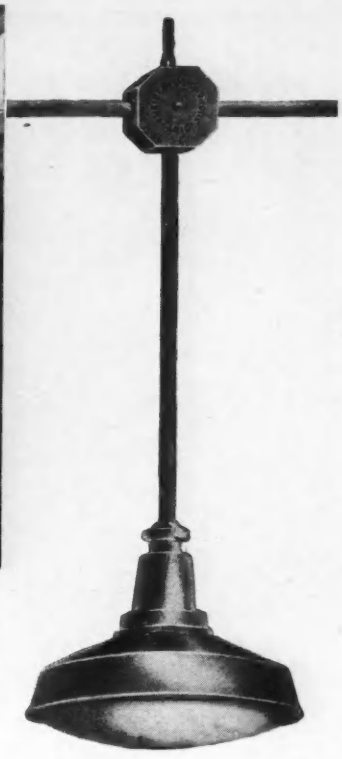
Use in conjunction with Meritus Low Voltage Transformers

MERITUS (BARNET) LTD. BARNET, HERTS Tel.: Barnet 2291/2

SWITCHGEAR SPECIALISTS

STATTER

J. G. Statter & Co. Ltd., 82 Victoria St. S.W.1



"260 feet a day...."

A most interesting history is attached to this extensive new store recently erected by Tate & Lyle Limited at their Plaistow Wharf.

The original building was situated on the old White City Exhibition ground. All the steel work was dismantled, transferred to Plaistow, renovated, re-painted and re-erected, thus providing additional warehouse space in quick time and without the many problems of obtaining new materials.

Similar economies were achieved in the provision of a good all-round general illumination. From the nature of the structure it would have been a formidable and costly job to install conduit throughout the building, on account of the great height of the building and the consequent length of the droppers necessary to mount the light fittings.

By using ENFIELD GRID SUSPENSION SYSTEM the wireman concerned erected 260 feet a day, including 8 light fittings and 2 feed points. This was twice as fast as any type of conduit installation and represented a great economy in time and materials.

Moreover, the wireman and his mate had never before used Grid Suspension, but after their first experience they had no difficulty in installing more than 260 feet a day when they started on a second warehouse nearby.

Another triumph for Mr. Cube and an Enfield product.

ENFIELD CABLES LIMITED · BRIMSDOWN · MIDDLESEX

Telephone: HOWard 2661 (Works) HOLborn 9292 (London Office)

Enfield

E.32

CORROSION

PROBLEMS SOLVED BY INSTALLING THE **NEW**

GILFLEX

INDUSTRIAL & FARM

WIRING SYSTEM

ALL-INSULATED
NON-INFLAMMABLE
CORROSION RESISTANT
AND
WATERTIGHT

FULL DETAILS FROM

GILFLEX CONDUITS
LIMITED
41 THE PARADE, HIGH STREET
WATFORD · HERTS
WATFORD 3422

NIPHAN CABLE COUPLINGS

Specialists in the design and manufacture of

WEATHERPROOF C.I. FUSE AND SWITCH FUSE BOARDS
HEAVY C.I. GROUND BOXES
Designs to requirements

For Electric Lighting Installations and Power Transmission, Communication, Portable Tools, etc.

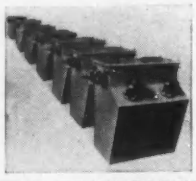
C.I. Ground Box with Terminal Sealing Chamber and Gland.
B7313 Type 5-way 15 amp. Fuse Board with Plug inlet.
B1223 Type 4-way 15 amp. Switch & Fuse Board.
NIPHAN

Write for fully illustrated catalogue to:

SIMMONDS & STOKES (NIPHAN) LTD
VICTORIA HOUSE, SOUTHAMPTON ROW, LONDON, W.C.I
'Phone: HOLborn 2163, 8637. 'Grams: Niphan, Westcent, London

TEC

POWER & DISTRIBUTION TRANSFORMERS



C.S.A. APPROVED
10 VA to 100 KVA Open, Enclosed, Oil Cooled D.W. & Auto
For
INDUSTRIAL ENGINEERING, FURNACES, ELECTRONICS, PHASE CONVERSION ETC.

THE TRANSFORMER & ELECTRICAL CO., LTD
EASTERN ROAD, WALTHAMSTOW, LONDON, E.17
Phone: KEYstone 5031/2

INSTRUMENT WIRES
INSULATING MATERIALS

WEST INSULATING COMPANY LIMITED
2 Abbey Orchard Street, Westminster, S.W.1
Telephones: Abbey 2814 & 7352

What goes on in Quality Street?

"NO ONE EVER SAYS 'NO' TO MACKINTOSH'S"

. . . as the advertisements say, and with good reason. You don't stay at the head of the parade in Quality Street year after year without making a tip-top product and without putting behind it all you've got in shrewd buying, manufacturing know-how and enlightened merchandising.

It is no coincidence that Mackintosh's, like so many other successful firms, make good use of Delaron Laminated Plastic. They use this versatile material for tough, smooth, easy-to-clean work-bench tops. Other people use it for a truly bewildering variety of jobs. Its exceptional combination of qualities may provide you with just what you want.

WHAT IS YOUR NEED? If you are looking for exceptional strength plus lightness (Delaron is half the weight of aluminium), if you want a material you can machine more easily than steel, if you want good chemical resisting qualities, or dependable insulation—at economical cost—then you'll find that Delaron gives you a better job for less.

Is your product here—cars, toys, office equipment, chemical plant, textiles, aeroplanes, radios, refrigerators, washing machines, stockings, food? Do you use gears, benches, machine guards, filing cabinets, templates, acid tanks? Then you'll be interested in Delaron, and it will pay you to find out more about it.

YOU CAN DO A BETTER JOB FOR LESS WITH

Delaron REGD
LAMINATED PLASTIC
MADE BY
DE LA RUE

WRITE FOR THE DELARON LEAFLET TO **THOMAS DE LA RUE & CO. LTD.** (PLASTICS DIVISION), 84-86 REGENT STREET, LONDON, W.1.
TELEPHONE: REGENT 2901.

Write or Phone for OUR CATALOGUE

48 pages illustrated of Electric Fires, Tubular Heaters, Kettles, Irons, Washing Machines, Refrigerators, Immersion Heaters and Circulators, Cookers, Clocks, Vacuum Cleaners and Floor Polishers, etc.

DRAKE & GORHAM WHOLESALE LTD.

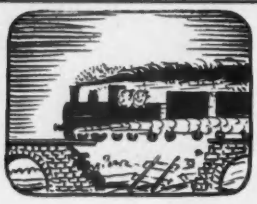
WHOLESALE AND MANUFACTURING ELECTRICAL ENGINEERS

77 LONG ACRE, LONDON, W.C.2

Tel: TEM 3993

and Branches:

MANCHESTER: 53 Sackville St., Manchester 1.	**CEN 7866**
BRIGHTON: 80a Queen's Road	**21894**
GLASGOW: 182 St. Vincent Street	**CITY 6411**
BRISTOL: 2 and 4 Church Street, Temple	**23509**
DUBLIN: 2 Church Lane, College Green	**78672**



"THE FLUXITE QUINS" AT WORK

"FLUXITE'S the best flux for repairs
The finest on earth I declare
This jolly old train,
Going smoothly again
Why, it's just like riding on air!"

For all SOLDERING WORK—you need FLUXITE Soldering Paste—the paste flux—with which even dirty metals are soldered and "tinned." For the jointing of lead—without solder; and the "running" of white metal bearings—without "tinning" the bearing. It is suitable for ALL METALS—excepting ALUMINIUM.

With Fluxite, joints can be "wiped" successfully that are *impossible by any other method.*

Used for over 40 years in Government works, and by leading Engineers and Manufacturers. OF ALL IRONMONGERS in tins—from 1/- upwards.

FLUXITE

SOLDERING PASTE

A Staunch Companion to Fluxite Soldering Fluid

SIMPLIFIES ALL SOLDERING

Write for leaflets on case hardening steel and tempering tools with FLUXITE, also on "wiped" joints.

FLUXITE Ltd., Bermondsey Street, London, S.E.1
Telephone: HOP 2632

ARTHUR BRIDGENS LTD. BROWN STREET SHEFFIELD 1

HIGH CONDUCTIVITY COPPER CASTINGS

Phone: Sheffield 21477. Tel.: "Arbridge," Sheffield

A Range of Fuse Switches of

Advanced Design
Outstanding Performance
Competitively Priced

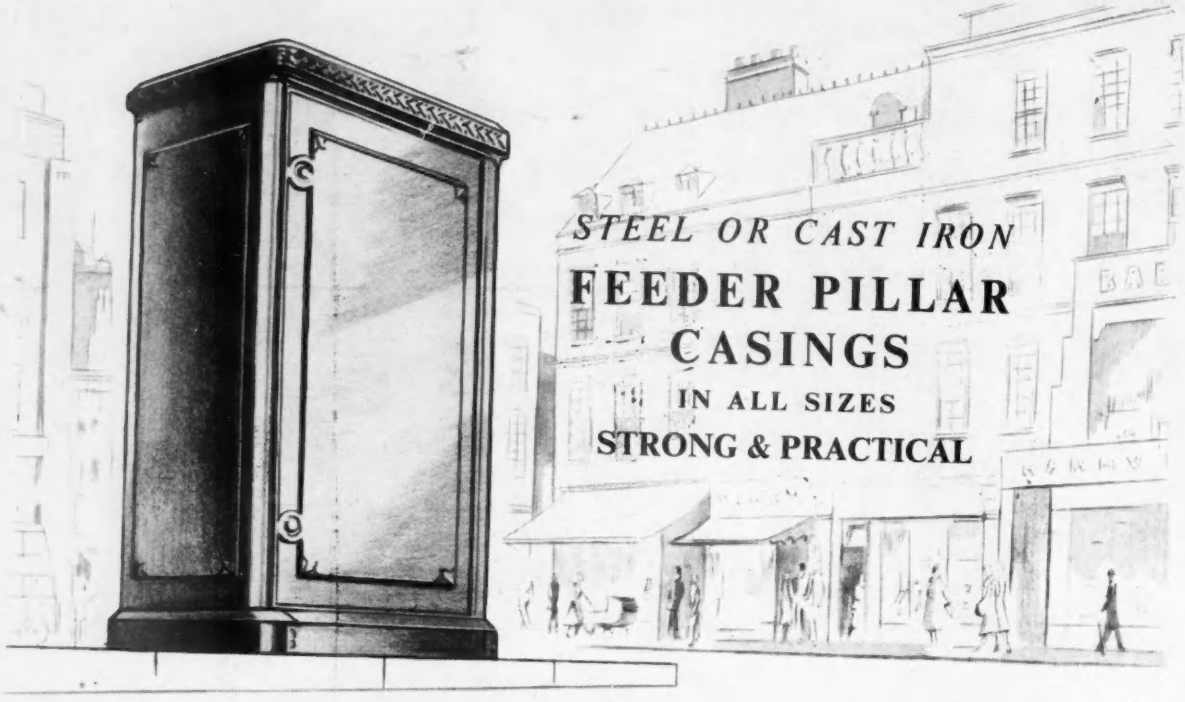
The **"SANDACLAD"**

Developed and Manufactured exclusively by

Write now for fully descriptive twelve page booklet
REFERENCE 151

SANDERS
WEDNESBURY

WM. SANDERS & CO. (WEDNESBURY) LTD., WEDNESBURY, STAFFS.



STEEL OR CAST IRON

FEEDER PILLAR CASINGS

IN ALL SIZES

STRONG & PRACTICAL

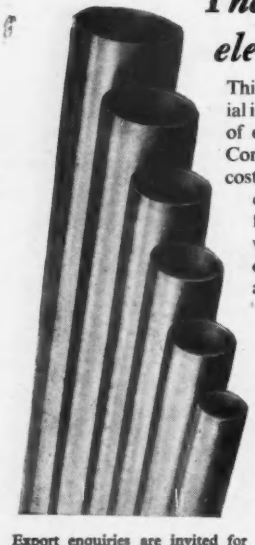
HARDY & PADMORE LTD., WORCESTER FOUNDRY, WORCESTER

Phone : Worcester 3215 Grams : "QUALITY," WORCESTER

M.W.109

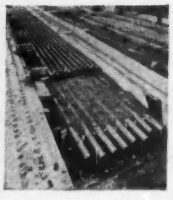
KEY **Fibre Conduit**

The Key to efficient electrical installations



This non-metallic, pitch impregnated material is now being widely used for the protection of electrical cables everywhere. Key Fibre Conduit is easy to handle, economical in cost and eliminates any electrolytic action on the cable and is recognised as ideal for the purpose. The material is lightweight in character and bends present no difficulty. Technical advice and assistance and quotations—on application.

Key Fibre Conduit is now available in two wall thicknesses; one for laying in concrete and the other for laying direct in the ground.



Export enquiries are invited for bulk supplies against payment in Sterling. New illustrated folder gladly supplied on request together with details of the greatly reduced prices available as a result of home production.

The illustration above shows Key Fibre Conduit laid on a bridge by Westminster Electric Supply Corporation Ltd.—45 years ago.

THE KEY ENGINEERING COMPANY LIMITED

London and Manchester 4 Queen Victoria Street, London, E.C.4.
Tel : City 1185-6 *Telegrams :* "Keypoint, Cannon, London".
Also at : Elevator Road, Trafford Park, Manchester, 17.

RECTIFIERS

WITH METAL RECTIFICATION

For— **BATTERY CHARGING, ENGINE STARTING, LIFT CONTROL, SIGNALS, COMMUNICATIONS, LABORATORIES, etc. WE SHALL BE GLAD TO QUOTE FOR EQUIPMENT MADE TO SUIT YOUR OWN PARTICULAR PURPOSE PROMPT DELIVERY**

CAYSON

CAYSON ELECTRICS LTD
QUEENS RD. WATFORD
Tel: WATFORD 7156 & 7177

Service &

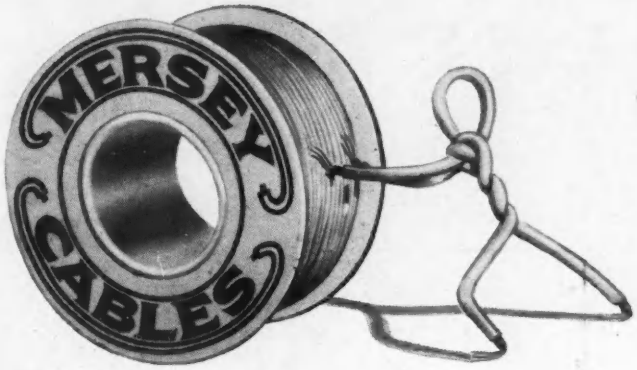
ENTerprise 6222

AUCHTERLONIE

BALL BEARINGS
ROLLER BEARINGS
PLUMMER BLOCKS, etc

Immediate Delivery. **Keen Prices. Write for monthly stock list A.1**

CHAS. AUCHTERLONIE & CO., LTD.
32 STATION RD., NEW SOUTHGATE, LONDON, N.11



THE MARK OF QUALITY

for

RUBBER AND THERMOPLASTIC INSULATED WIRES, CABLES AND FLEXIBLES

MERSEY CABLE WORKS LIMITED

LINACRE LANE · BOOTLE · LIVERPOOL, 20

Telephone: BOOTLE 4111 (4 lines)

Telegrams: MERCABLES LIVERPOOL, 20

A TI COMPANY

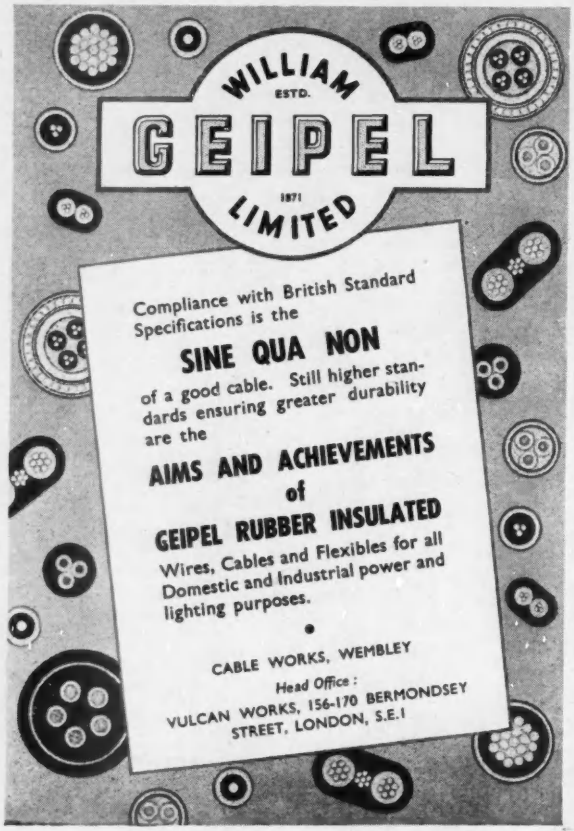
GENRISTO

LTD.

OSMASTON STREET, NOTTINGHAM

Boiling Plate

850w—6" diameter
SOLID PLATE
EMBEDDED ELEMENT
Volts—200/10 and
230/50



***Visidial* DEEP FAT FRYER**

Immersion oil heaters, anti-toxic, Admiralty bronze, halve the electric bill. Immense savings in fat or off-the-ration cooking oils. Variable thermostat with patented light-fail picture panel.

Approved for sale by London, South Eastern, Eastern, North Eastern Electricity Boards, etc., etc.

EVERY LARGE-SCALE KITCHEN A FOTENTIAL CUSTOMER

Send for Catalogues to:

JOHN KELLY & SON

Head Office: 71 George Street, Edinburgh

If you are wanting low-voltage transformers for portable tools, emergency lighting, or floor and soil warming,

please ask **LOHEAT** *to quote*

LOHEAT LTD., EDDINGTON WORKS, HUNGERFORD, BERKS.

Phone: HUNGERFORD 244

COUGHTRIE

FITTINGS

The Natural Selection

Always better than they have to be

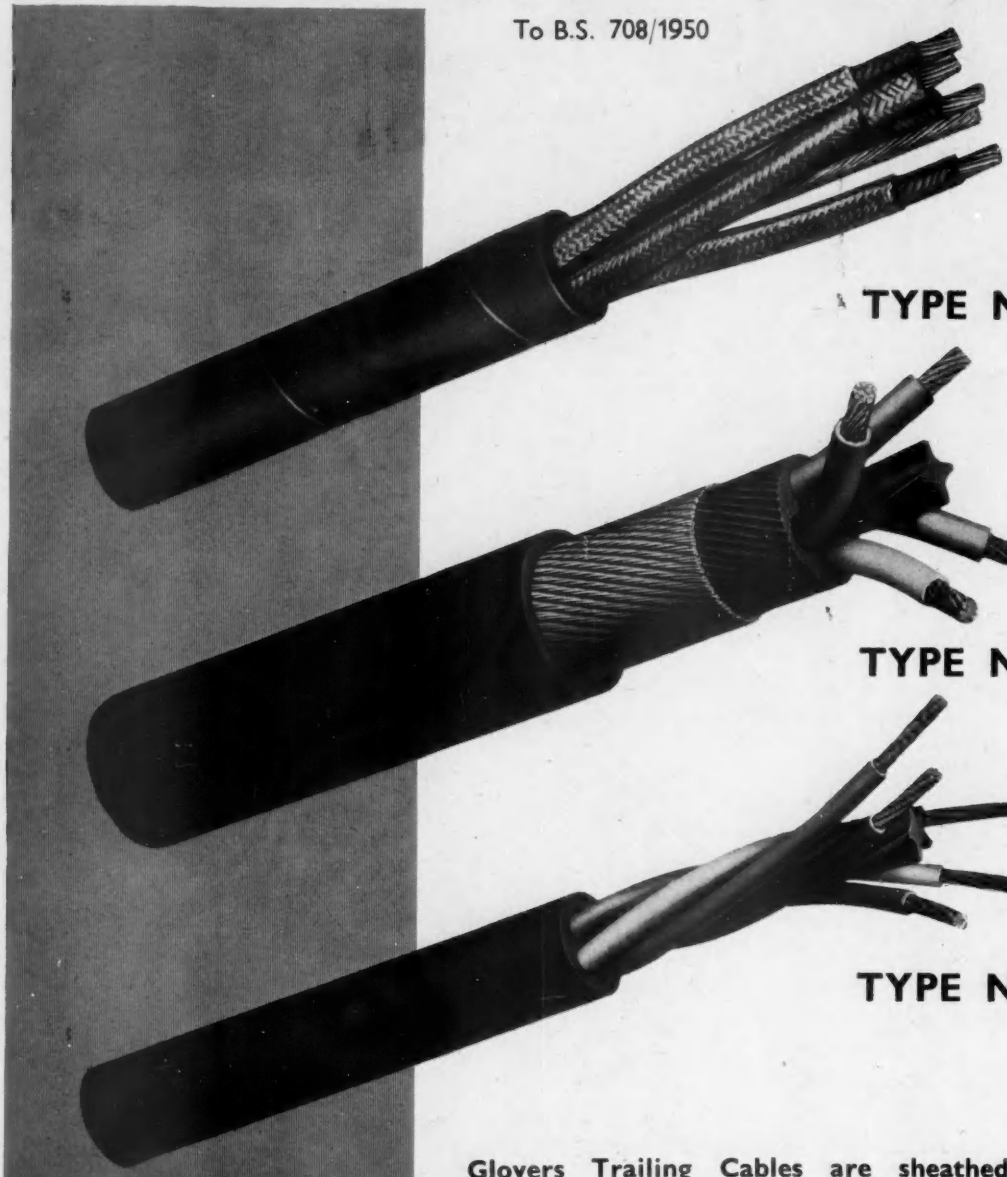
CATALOGUE AVAILABLE ON REQUEST

MANUFACTURED AT **HILLINGTON, GLASGOW, S.W.2**

by **J. & G. COUGHTRIE Ltd.**

GLOVERS TRAILING CABLES

To B.S. 708/1950



TYPE NO. 7

TYPE NO. 21

TYPE NO. 30

Glovers Trailing Cables are sheathed with polychloroprene compound which is fire, oil and weather resisting.

W. T. GLOVER & CO. LTD.

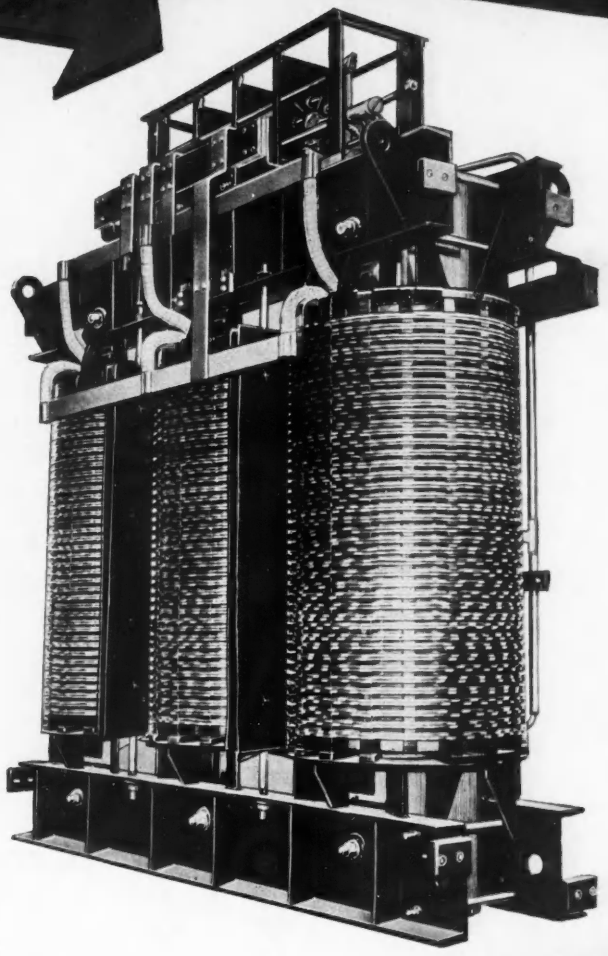
MEMBERS OF THE C·M·A

TRAFFORD PARK · MANCHESTER 17

TRAFFORD PARK 2141

Printed in England by Staples Printers Limited at their Great Titchfield Street, London, establishment, for the Proprietors, THE ELECTRICAL TIMES LTD., and published at Sardinia House, Sardinia Street, London, W.C.2.

Denis Ferranti Group



POWER TRANSFORMERS

The illustration shows a 3,750 kVA 11,000/3,300 volts 50 cycles 3-phase Transformer. Similar construction is employed up to 10,000 kVA. Larger Transformers are built up to 30 MVA. 66 kV.

DENIS FERRANTI LTD.

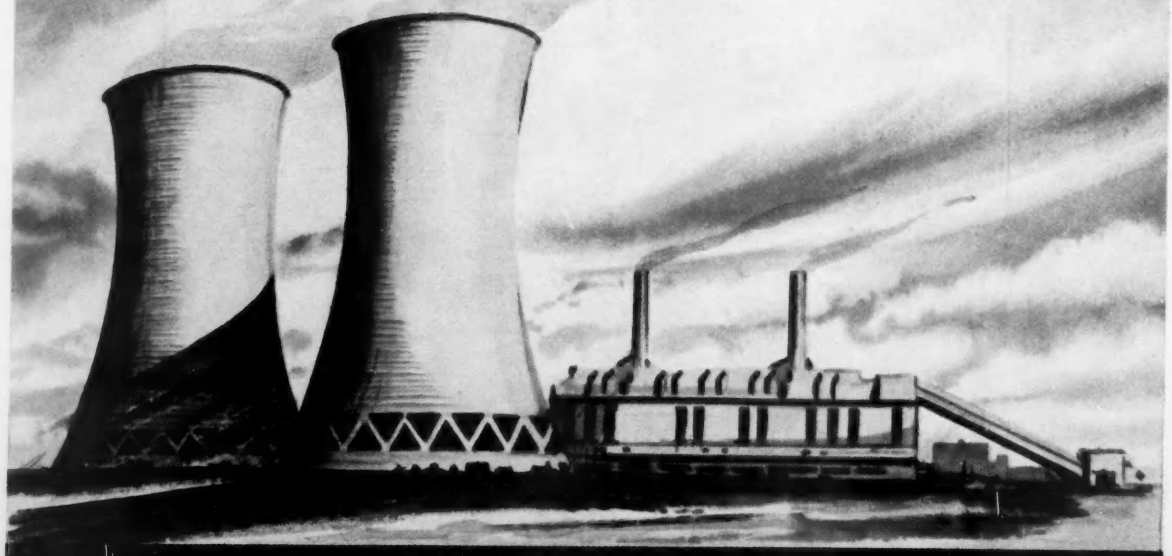
TEL:- MAI (OLDHAM) 6651 · ROYTON OLDHAM LANCASHIRE 'GRAMS "DEFERRANTI, ROYTON"
Sole distributors in Canada: Eastern Electrical Supply Co., 422 McGill St., Montreal. Lancaster 9148

CONDENSING PLANT AND AUXILIARIES

FEED HEATERS · DEAERATORS · EVAPORATORS · SELF-CLEANING WATER STRAINERS

FOR

POWER STATIONS



HICK HARGREAVES

AND COMPANY LIMITED · BOLTON